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Weight Lifting through Life: A Guide to Safe Weight Training

John A. Andrew
University of North Dakota

WEIGHT LIFTING THROUGH LIFE:
A GUIDE TO SAFE WEIGHT TRAINING

by

John A. Andrew
Master of Physical Therapy
University of North Dakota, 1998
Certified Strength and Conditioning Specialist
National Strength and Conditioning Association, 1997

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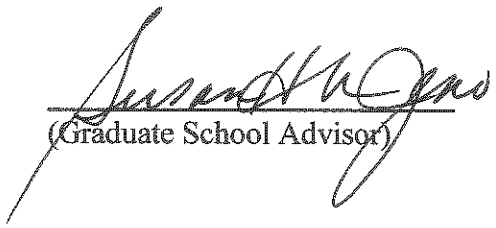
This Scholarly Project, submitted by John Andrew in partial fulfillment of the requirements for the Degree of Doctor of Physical Therapy from the University of North Dakota, has been read by the Advisor and Chairperson of Physical Therapy under whom the work has been done and is hereby approved.



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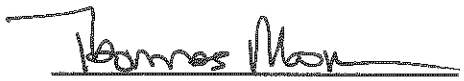

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Signature(s) John Ardrant T-

Date 12-10-07

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ABSTRACT / FOREWARD

You Can Lift Weights Without Getting Hurt!

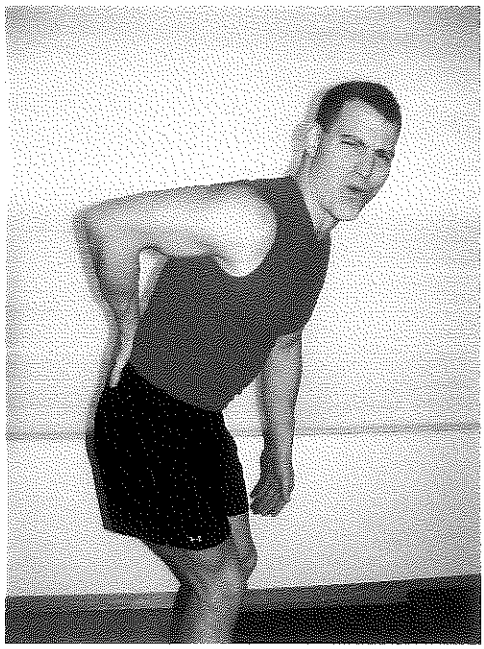
Have you ever injured yourself when trying to lift weights or initiate an exercise program? If so, you are not alone. Over many years of working as a physical therapist in an outpatient orthopedic and sports medicine clinic I have been surprised by the number of people that walk through the doors that are hurt by weight lifting. This really concerns me as one should not get hurt lifting weights as this is the opposite of why you are training. You are trying to improve your health—not get hurt! I am amazed by the exercises that people perform and are often taught in local gyms, schools or are self taught at home through books or even exercise videos. The problem is that many of these exercises are taught to them by people who: 1. Do not lift weights regularly themselves or 2. Do not have any formal education regarding the body and its biomechanics and anatomy. Their instructors aren't ill-intentioned or trying to cause harm but simply do not know that they are teaching someone a potentially harmful exercise in the first place. Like anything else, the exercise industry is fraught with people who have just enough knowledge to be dangerous. If you want to benefit from the latest medical research, my personal experience with weight training, education and years of experience in the clinic then read on. Now, please do not misunderstand me as I have made my share of blunders in my own training as well. You can learn from my mistakes and avoid injury! Enclosed in this book are the tips and techniques that I wish I would have known from the very beginning when I started to lift weights. I want to save you from some pain! In the pages that follow I will not only point out the exercises that are "safe" to perform but will also highlight those which are unsafe and in many cases downright harmful.

This book will educate you so that you can avoid the pitfalls of performing poor exercises which carry a predisposition for causing injury and highlight the ones that you can safely perform for a lifetime.

INTRODUCTION / FOREWARD

You Can Lift Weights Without Getting Hurt!

Have you ever injured yourself when trying to lift weights or initiate an exercise program? If so, you are not alone. Over many years of working as a physical therapist in an outpatient orthopedic and sports medicine clinic I have been surprised by the number of people that walk through the doors that are hurt by weight lifting. This really concerns me as one should not get hurt lifting weights as this is the opposite of why you are training. You are trying to improve your health—not get hurt! I am amazed by the exercises that people perform and are often taught in local gyms, schools or are self taught at home through books or even exercise videos. The problem is that many of these exercises are taught to them by people who: 1. Do not lift weights regularly themselves or 2. Do not have any formal education regarding the body and its biomechanics and anatomy. Their instructors aren't ill-intentioned or trying to cause harm but simply do not know that they are teaching someone a potentially harmful exercise in the first place. Like anything else, the exercise industry is fraught with people who have just enough knowledge to be dangerous. If you want to benefit from the latest medical research, my personal experience with weight training, education and years of experience in the clinic then read on. Now, please do not misunderstand me as I have made my share of blunders in my own training as well. You can learn from my mistakes and avoid injury! Enclosed in this book are the tips and techniques that I wish I would have known from the very beginning when I started to lift weights. I want to save you from some pain! In the pages that follow I will not only point out the exercises that are "safe" to perform but will also highlight those which are unsafe and in many cases downright harmful.



This book will educate you so that you can avoid the pitfalls of performing poor exercises which carry a predisposition for causing injury and highlight the ones that you can safely perform for a lifetime. Let's get started!

Did you know your body was made to move?

In our sedentary society of long commutes, computerized desk jobs, long work days and video games, having a way to give our muscles the resistance that they crave is more important and unfortunately more challenging than ever before. Like a tree in the wind that lays down strong roots in response to the battering of the wind, so it is with your body. The only way your muscles stay strong is with resistance. Neglect your body without a little daily resistance and one day you will be the owner of a weak and frail body and even your daily activities soon will make you tired. However, if you maintain your muscles with a little resistance each week, then you can maintain and even improve

your strength to a new level. You can have energy and strength to spare for work, household chores, and fun!

Our bodies are wonderful movement machines and when you move your body its gets stronger! How many machines can you name that getter better with use? The Body Machine—MADE TO MOVE!

The Most Important Ingredient for Success: YOU!

What I love about resistance training is that it is an activity that you can do for yourself once taught. In my opinion, there is nothing more powerful than being able to help yourself or someone else. No one else can help you more than you with regards to your fitness level. Who else is with you 24 hours per day? Medical and fitness professionals may guide you along the way and this is why we are here, but ultimately you get to do the work and make the lifestyle decisions! I have faith in you, but, do you believe in yourself? Start now—this is a new day. You will be armed with new information after reading this book which should give you new success. If you have tried and failed before, now is the time to try again.

Weight Training when combined with aerobic activity and a sensible diet can transform not only your body but change your life by making you more confident and giving you more energy!

Weight Training Factoid: You can change how you look and feel with weight training! This is a story of how my body was transformed from 230 pounds to a lean and healthy 150.

A Success Story from the Author:

As a child I struggled with a weight problem. You may recall stories in school where you were the object of name calling or a cruel joke. I can remember being called most of the names in the book as it relates to being overweight.

It wasn't until I was a teenager involved in sports that my weight finally stabilized and reduced to a healthy level. I watched Frank Zane, Lou Ferrigno and Arnold Schwarzenegger in bodybuilding competitions on TV, and I was impressed by all of those bulging muscles. To my parents' dismay, I especially liked the Incredible Hulk. I don't remember many of the plots but I always loved it when the Hulk would flex those muscles! At the age of 14, my parents purchased a weight set for me for Christmas. It was the best present that I ever received as it started a lifelong hobby. This fascination with muscles and how they worked later expanded to an interest of the human body and led to my decision to become a physical therapist. Combining anatomy with helping others seemed like a perfect combination.

I started to lift weights and loved how it made my muscles feel more toned after just a few weeks of training. I also noticed that some of the body fat was melting away even though my eating habits hadn't changed that much (Oh, the miracle of youth!).

However, I still hadn't learned truly how to eat. The increased activity level in sports and weight training were merely burning off the extra calories that I was eating. So after high school, when I wasn't involved in competitive sports anymore, my weight

slowly increased over the next 7 years until at the age of 26, I was 230 pounds! *My activity level slowly decreased but my caloric intake stayed the same—a perfect formula for weight gain.* It was as if I woke up one morning and wondered what had happened to the functional athletic body that once worked so well for me. Also, I checked in with my physician and my blood pressure and cholesterol were also high. How did all this happen?

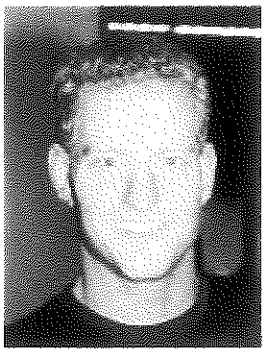
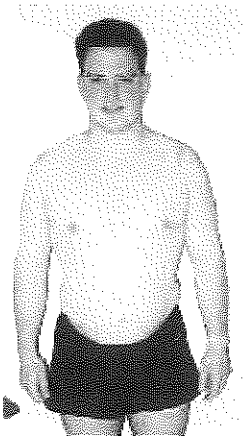
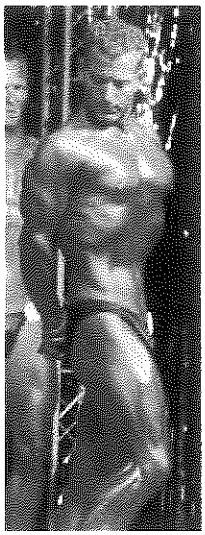
I struggled over the course of the next 6 years to slowly lose weight by changing my diet while exercising. I began reading prolifically on diet, nutrition and exercise. The answers existed and I just needed to find them and put them into action. Unfortunately, I was stuck at 185 to 190 pounds—still too heavy for someone 5', 7". Having a family history of diabetes and with diabetes being linked to obesity, I needed to make some changes. At the age of 63, my mom had diabetes, was on dialysis, blind, and had one leg amputated. She died at the age of 64. However, before she died I remember her looking me straight in the eyes, from the dialysis machine and missing both legs from amputation saying, *"John, whatever you do, don't get diabetes."* At that moment a switch in my mind was thrown and I knew that I had to lose the weight if I wanted a healthy life. In an indirect way my mom was telling me to lose the weight and get healthy. I had no choice but to listen.

My wife knew that when I was younger, one of my goals was to enter a bodybuilding competition. After hearing my mom's wishes to lose weight, she asked me if I was still planning on accomplishing this goal. I expressed sincere doubt that I could ever get in decent condition again, let alone the leanness for a bodybuilding competition. I had given up this goal and perhaps given up on me. However, my wife encouraged me to follow my dream and expressed confidence in my ability to succeed. She had always given me good counsel in the past so I thought that she must be telling the truth even if it was biased by love.

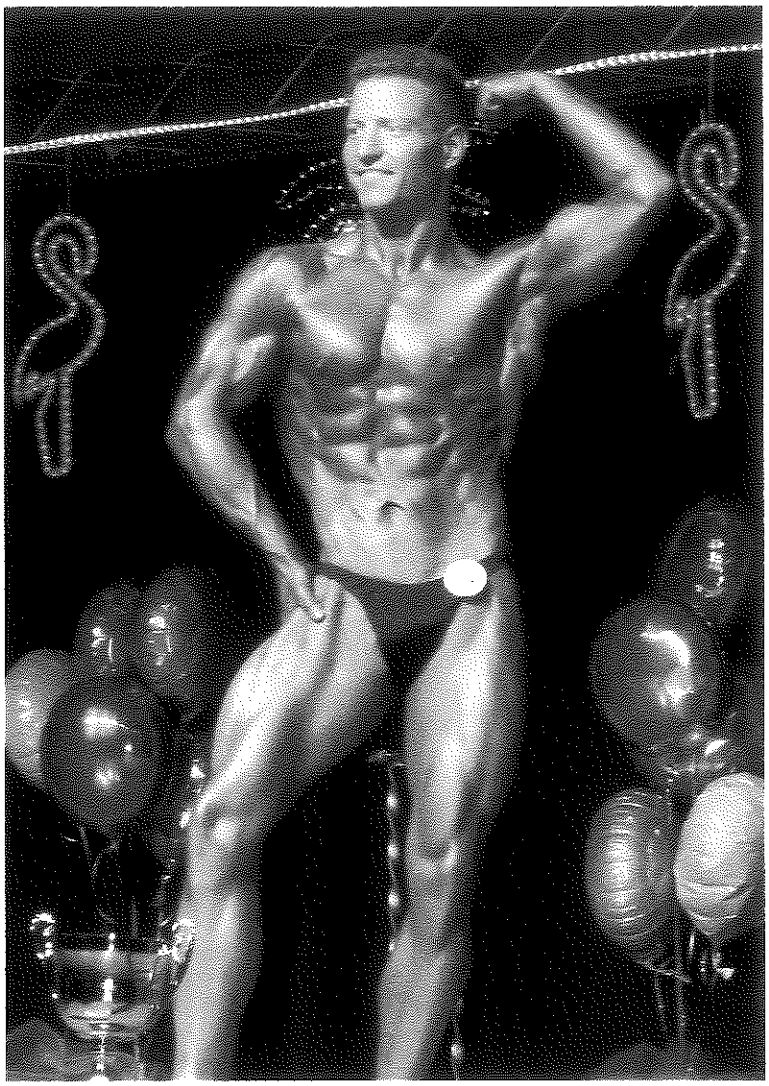
With a renewed commitment, I started to perform aerobic exercise regularly. At first it was walking, then jogging and then when my feet started to hurt from plantar fasciitis I chose non-impact forms of exercise like an elliptical machine and biking. This was supplemented with weight training of 3-4 days per week. It felt good to feel good and it built momentum!

What really made the difference this time was that I started monitoring my caloric intake through a food journal. I had never done this before even though it was a common recommendation that I had heard dieticians make. I couldn't believe how many calories I was consuming—about 2800-3500 calories per day! No wonder I couldn't lose that fat that had plagued me. My goal was to lose ½ to 1 pound per week. Many books that I had read advised dividing your daily allotment of calories out over 5 to 7 small meals per day which is exactly what I did. I still can't believe how eating many small meals each day works so well to burn fat and reduce hunger (see diet chapter for more details).

Through this method and my wife's encouragement, I was able to reach my goal body weight of 150 lbs and enter my first bodybuilding contest! It was wonderful to reach a goal that I never thought was possible and in the process regain my health and have more energy. Not to mention that my blood pressure and cholesterol were low for the first time in my life. Instead of coming home from work tired and exhausted, I was able to come home and have energy left for family, work and play! Weight training, aerobic exercise and a sensible diet can help you reach your life goals.

John at 230 and 150, showing changes in facial appearance, and in trunks at 185 and 150



And 1 year later at 150—1st Place at Oregon IronMan Bodybuilding Contest

Health is a lifestyle, not just a temporary phase or diet.

Health is a lifestyle, not just a temporary phase or diet. Once you experience a healthy lifestyle you never want to settle for anything else. This lifestyle consists of a healthy balanced diet and regular exercise. As far as our physical bodies are concerned, movement is life. When you stop moving bad things start to happen to your body in many ways and at many levels. Get out there and start moving! Change is never easy but once you start you gain momentum and feeling good is a hard habit to give up. I believe in you! Do you believe in yourself? Enough talk, let's get started.

CHAPTER 1: WHY LIFT WEIGHTS?

You Can Lift Weights for a Lifetime and Improve Your Health

Weight training is completely safe and can be performed for a lifetime when you train smart and safe. The key is performing the right movements in good form. Why not lift weights for a lifetime? You can when you do it right no matter what your fitness goals. Perhaps you want to be free from joint pain, return to a sport, lose weight, walk with less pain or have more energy for work and play. Your goals could be health related if you suffer from say osteoporosis or osteopenia and you would like to improve your bone density. Do you have a history of diabetes in your family and want to get in better overall shape to decrease your risk of getting this disease? Maybe you want to just "look better" and have a toned and athletic body to boost your self-esteem. Your goals could be more functional such as to be able to walk up stairs and carry in the groceries when you are 92! No matter what your goals, having more strength throughout your life will help you reach them! You don't need to be involved in painful and grueling workouts to realize the benefits.

Have you built any pyramids lately? You are about to start. Persistence over time is the most important recipe for success with building muscle. This is another reason people get hurt with weight-lifting—striving for too much too soon. It takes your body time to adapt to the stressor of weights and to get stronger. It is a cell by cell process much like the pyramids that were built one brick at a time. There aren't any quick fixes but over time those small "baby steps" add up to huge strides that can climb mountains!

Muscle Factoid: Persistence over time is the most important recipe for success in building strength. Consistency is key! Think of the pyramids!

We all want results fast, don't we? Sometimes an individual will come in to our physical therapy clinic for help and after two physical therapy sessions will comment, "I don't feel any stronger." To this I explain, "You have just begun. Give your body time to adapt. If you continue training you will get stronger!" Resistance training is very well researched as a time and tested method of increasing strength—it really works. It realistically takes about 3-4 weeks to start to realize gains in strength from resistance training. Don't give up too soon as you could be getting ready for an increase in strength just before you quit! If improving fitness were a quick fix then everybody would be in great shape and athletes would not need to train. However, we all know that this isn't the case, so don't be unrealistic with your body or your goals.

Perhaps you have tried lifting weights before only to get hurt. I can't tell you how many times I have heard versions of this story, "I can't lift weights, the last time I lifted weights my back (or shoulder, or knee—you fill in the blank) hurt for months!" However, after exploring what they were doing when this injury occurred, usually they were performing what I would call a "risky" or "Red Light" exercise and didn't even know it. "Red Light" exercises are exercise movements that some people can perform and not get hurt (i.e. when you are a teen-ager or in your early twenties). However, as we age our body isn't as forgiving and we have to exercise differently.

Here are some distinct reasons people get injured from weight training:

1. Too much weight.
2. Improper form. (i.e. bouncing, jerking or using the wrong range of motion in an exercise even though the exercise itself may be O.K.)
3. Performing a biomechanically inferior exercise (bad exercise or movement pattern that perhaps the body wasn't designed to do repetitively or under load in the first place). Put simply, too long of a lever-arm on the joint being worked. There exercises typically place a shear force or compressive force on the joint or muscles involved setting you up for a painful experience—literally.
4. Lack of warm-up.
5. A combination of some or all the above.

If you want to exercise for a lifetime and minimize your chance for injury then read on. Let's take a journey to better fitness with the goal being a better quality of life through ease of mobility and increased energy—increased energy for family, work and recreation!

Muscle Age Factoid: It is not inevitable that you will lose muscle and gain fat with age. Instead, you can lift weights and counter this trend!

Of course there are physiological reasons to lift weights. Unfortunately, as all of us age, after 30 we start a slow process of losing muscle mass and strength, this accelerates after the age of 45.[1] Losing muscle mass is bad as it means that the main substance in our body, our "engine" so to speak, is getting smaller and requires less fuel (or calories) to maintain. As we lose muscle our metabolism slows down and the next thing you know, it is more and more difficult to keep off those extra pounds—I'm not talking about muscle either. Studies have even shown that weight gain is not so much a function of age as it is activity level. In other words, people do tend to gain weight with age but this is more from decreasing activity level, and corresponding loss of muscle mass, rather than the actual aging process itself. This is great news, though, because it means that there is something that you can do! It is not inevitable that you will lose muscle and gain fat with age; instead, you can lift weights and completely counter this trend. What good news!

Plus an extra bonus is that the more muscle you gain the more you can eat without gaining fat. It may be only be a small amount but it adds up over time. Consider this fact; each pound of muscle that you gain burns an extra 30-50 calories per day. This means you get to eat an extra banana if you gain two pounds of muscle, and instead of storing it as fat you can burn it for fuel to maintain your muscle. I experienced this very phenomenon as it helped me lose a lot of weight and best of all improved my quality of life!

Why Should you Lift Weights? Not convinced yet? Here are some compelling reasons!

Increase lean muscle mass & pump up your metabolism:

Numerous studies have shown that one huge benefit of weight training is that it increases muscle mass and blunts muscle loss over time.[1-8] As an added bonus, for every pound of lean muscle (muscle, not fat) that you gain it raises your basal metabolic rate by 30-50 calories per day.

Muscle Factoid: Each pound of muscle burns 30-50 calories per day just to maintain itself even at rest. Great news if you want to burn fat!

This means that even when just seated and resting you are burning more calories. This is good news because you can eat more and not put on fat weight or looked at from a different angle, you could eat the same as you do now and lose weight assuming that you gain muscle! As we age we tend to lose muscle mass especially after the age of 30. However, resistance training can counter this trend and you can maintain and improve your muscle mass with age if you are willing to be diligent with your training.

Prevent Muscle Loss or Wasting (Sarcopenia):

Muscle Factoid: All of us will lose 5-7 pounds of muscle every decade *unless* we perform resistive training exercise.

As all of us age we are guaranteed to loose 5-7 pounds of muscle every decade.[1,3] Some researchers put it a different way and say that we will lose ½ pound of muscle per year. How depressing! However, you have a secret weapon that can keep this from occurring—yes—you guessed it: Weight Training!

This age-related muscle loss was coined "sarcopenia" which literally means "loss of flesh" if we break in down to its Greek word roots. The good news is that by lifting weights just a few times per week, you can help stave off the effects of time and hold onto that muscle.[9-15] Moreover, as we age, we need strength even more for functional purposes than when younger. To walk up and down stairs, carry the groceries in from the car, mow the lawn, go to work and perform the myriad of other activities that are required just to live--clearly muscles are crucial.

To the right is Clarence Bass at age 65. Doesn't he look great! No muscle loss here—obviously weights help you keep the muscle. Compare this to the average 65 year old non-exerciser. Mr. Bass has stayed fit for a lifetime through a healthy diet and a reasonable exercise program which includes weight training. He can be found on

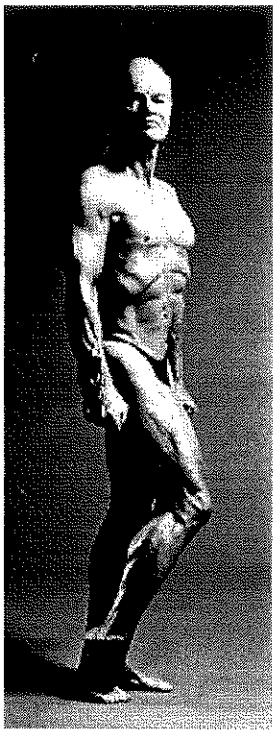


Figure 1.0: Clarence Bass at age 65 with plenty of muscle!

the web at www.cbass.com or may be reached by phone at (505) 266-5858.

Decrease Arthritic Pain.

Although somewhat counterintuitive, resistance training lessens joint pain. You would think that lifting weights would make joint pain worse but actually the opposite is true as a reasonable program can reduce pain from osteoarthritis. There seems to be a link between muscle weakness, pain and function.[16,18,19] In other words, if you strengthen the muscles around a joint, when it is done in a safe and reasonable manner, the outcome is usually less pain. Research has found this to be especially true for the knee.[17] Specifically, strengthening the muscles of the thigh (Quadriceps) seems to have a protective effect on the knee. However, again a safe and well thought out exercise program must be followed so that excessive stresses are not placed on the knee. We will discuss some safe (green light) exercises for the knee in a later chapter.

Keep in mind that we are more likely to wear out from lack of use than too much. Some age-related changes to our joints occur from a sedentary lifestyle. The cartilage inside our joints doesn't have actual blood vessels that supply it. Instead it relies on synovial fluid or "joint WD 40" because it is this milky substance that helps to lubricate and nourish our cartilage. The synovial fluid carries nutrients to and waste from our cartilage but the catch is that it takes movement to do the job right! When we are sedentary, the synovial fluid does not circulate very well and the cartilage can harden and shrink as a result. The synovial fluid relies on movement to compress and circulate it throughout the joint and cartilage. A mobile joint is a healthy joint because it is getting good nutrition—joints love to move!

Strengthening the muscles that cross painful joints is a real plus as it does nothing but give them more support. Also, when you are exercising you are performing range of motion (ROM) for your joints which helps to keep them flexible. Movement is a wonderful thing!

Improve Bone Density.

Resistance training is well documented to help improve bone density.[20-24] This is good news for all of us as we are all living longer and need strong bones! After age 30, we start to make some withdrawals from our bone supply, at 40-45 it picks up the pace some more, and then at age 50 the losses accelerate even more. This is especially true for women after menopause. It is crucial to perform resistive exercises to counter this trend. Research indicates that performing 8-12 repetitions is best for building bone mass. However, at times more repetitions may be recommended with certain exercises to lessen the stress on an injury prone joint (i.e. the shoulder).

Here are some other well agreed upon facts about bone mass which will encourage you to lift weights. Decreased activity or a sedentary lifestyle leads to bone loss. If you aren't stressing your bones, why should they stay strong? In women, after menopause, the hormone changes trigger the loss of minerals in bone. In women and men, loss of muscle mass is correlated with reduced bone mass. This makes sense, too, because if you aren't using your muscles to keep them around then your bones think they can take a vacation to Tahiti as well. For men, the slow decline in testosterone can lead to loss of bone mass and the later development of osteoporosis. In men, weight training slightly elevates your testosterone levels for a brief period the same day. However, in

women, no significant increase in testosterone levels has been found. Don't worry ladies, you won't be singing base if you start to lift weights.

Some people lose bone density to an extent that they start to bend (curve) over (kyphosis) in their latter years from osteoporosis due to the "wedging" of spinal vertebra. In these cases, the vertebra start to assume a "pie shape" instead of a square shape and the result is not being able to stand erect. In a sense, the spine begins to crumble. However, when you lift weight your muscles pull and tug on your bones and this extra stress helps to make the bones stronger! Lifting weights is one of the most potent things you can do for yourself to strengthen your bones. Of course having the necessary ingredients, or nutrition, to support bone growth is important but without the stress to make the bones build the effect is minimal. Weight training combined with proper nutritional support is a sure winner every time!

Improve Balance.

Feeling unsteady? Although balance is a complex activity involving your nervous system, semicircular canals, and vision, having strong legs can improve your balance. This is a real plus because as we age our balance tends to slowly decline. Lifting weights not only strengthens your muscles but keeps your bones strong as well so you are less likely to fall and break a bone in the first place. It is always good to stand on your own two feet—literally.

Improve Glucose Metabolism & decrease your risk of adult onset diabetes.

Research has demonstrated conclusively that pumping iron has a favorable effect on glucose metabolism.[25-28] One study even showed an increased glucose uptake of up to 23% after just 4 months of resistance training.[28] This is a huge benefit as adult onset diabetes in closely tied to poor glucose uptake. Your muscles are like a sponge in that the more you exercise them, the better they get at "soaking up" extra blood sugar that is in the blood stream. This is good news if you have Type II diabetes or are a borderline diabetic with developing insulin resistance (a marker for metabolic syndrome).

Metabolic syndrome is a pre-diabetic state when your body begins to resist the action of insulin. This is bad because insulin is the "doorman" that lets the excess blood sugar out of your blood stream and into the cells where it belongs. Excess sugar in the blood stream leads to high blood sugar levels and a diagnosis of diabetes. Metabolic syndrome is defined by the American Heart Association by the following traits: *abdominal obesity*, high cholesterol (high LDL and low HDL), high triglycerides, elevated blood pressure, *insulin resistance* or glucose intolerance, prothrombotic (easier for you to form a clot) state and high proinflammatory state (elevated C-reactive protein in blood).[29] Insulin resistance and excessive levels of abdominal fat are two dominant risk factors for developing metabolic syndrome. It is interesting to note that decreasing your abdominal fat usually helps to decrease insulin resistance so this gives you some control over your destiny.

Onset of insulin resistance, a precursor for diabetes, is often associated with an increase in abdominal fat accumulation and loss of muscle mass. This is because if you are sedentary you lose muscle, your metabolism further slows and assuming you are eating the same those extra calories are stored as unwanted body fat. However, a few

months of resistance training can result in fat weight loss as well as an increase your muscle mass, both of which can help you decrease your risk of diabetes once again.

As discussed in my success story, before I lifted weights and was holding more abdominal fat than I should have, my blood cholesterol profile was elevated, and my blood pressure was somewhat high not to even mention that I was fatigued much of the time. So tired that at the end of a workday I was pretty much useless. This was the beginning of the metabolic syndrome creeping in. However, at this stage it was reversible. I only mention it so that if you can identify with any of these signs that this book will help you take notice and make a change for the better starting today!

Muscle Factoid: An actively exercising muscle is a muscle that soaks up blood sugar like a sponge—it's hungry for fuel.

Having had a mother with diabetes I realized that it was a disease that does not discriminate. In her latter years of life, it took away her vision (retinopathy), both legs (amputation), and kidneys (renal failure) which in turn robbed her of mobility and quality of life although it couldn't harm her warm spirit. It is a difficult thing to watch someone have her blood circulated through a dialysis machine while missing legs. When she died at the age of 64 it seemed unfair that this disease had taken so much from her so quickly. If you have a family history of diabetes, or even if you don't, in my opinion you are crazy not to lift weights since it will help decrease your risk of adult onset or Type II diabetes.

Feel & Look Better/Have more energy!

Perhaps the greatest motivator for me to lift weights is that I feel and look better when exercising. It energizes my morning and gets me ready to start the day no matter what is coming. Is it always easy to start that morning workout? Certainly not…however, I have yet to experience a workout where I didn't feel better after I was done.

Reduce abdominal fat and help fight colon and breast cancer:

Lifting weights has been found to help reduce abdominal fat. Who wouldn't mind have a slightly flatter tummy when putting on those jeans? Although spot reduction (preferentially losing body fat on a certain body part) does not work there is evidence that resistance training helps you to lower your percent body fat.[27]

New research also indicates that weight training may help fight colon and breast cancer by creating positive changes in levels of glucose and IGF-1 (growth factor) which are linked to tumor growth in cancer.[30] Both of these changes could help one win the battle against colon and breast cancer. Furthermore, weight training just twice per week improved breast cancer survivors' outlook on life according to a recent study.[31] Researchers explained that women in the weight training group felt they had more strength, speed and self-confidence as a result of the workouts. They further stated that the weight training seemed to help them to regain a self of control of what was happening to their bodies. Put another way, when you feel stronger and leaner it lifts your self esteem and gives you an internal locus of control even when other things seem to be chaotic. It feels good to be lean and strong!

Sleep Better & Relieve Depression:

Researchers have found that for people who were mildly to moderately depressed, strength training helped them sleep better, relieved depression, improved their mood and in some cases even improved cognitive function.[32-36] In today's high stress world, who would not benefit from sleeping better and having an improved mood? A little extra blood flow to the brain does wonders for all of us and resistance training is a great way to do it.

Does your low back hurt?

At some point in our lives, statistics tell us that unfortunately 80% of us will have low back pain at one time or another. Given this grim statistic, we need to do everything we can to sway the odds in our favor. Strengthening the lumbar extensor muscles has been linked to decreased levels of low back pain.[37-40] Even beyond just getting rid of pain, lessening time lost from work or even play is good reason for all of us to take care of our back. Later in this book, specific exercises that help strengthen your back muscles will be presented. However, potentially damaging ("red light") exercises will also be highlighted. These are exercises that have a tendency to pinch nerve roots and crush intervertebral discs. The key to proper strengthening is to pick exercises that work your low back muscles yet protect the lumbar discs from excessive shear and compressive forces.

Maintain Independence Now and in Your Latter Years:

Although it can be hard to get motivated at times to exercise and stay active it will pay off in your later years of life in a big way by helping you maintain your independence. Most people I come in contact with would much rather be able to perform their own activities of daily living (ADLs) such as dressing, grooming, grocery shopping, and taking care of the yard. However, many people are stripped of being able to perform these activities because of weakness, general debility and poor balance. The cure: Physical Activity! A recent study, found that every hour spent being active each week decreased your risk of not being able to perform your ADLs later in life by a whopping 7%![12] In other words, keep mowing that grass, pulling those weeds, and performing your own chores around the home when possible. After all, the only way your body knows what you need to be able to do is if you make it do it to maintain that ability. Use it or lose it holds true once again! Pumping iron can help you stay strong and active so you can be independent for years to come.

Summary:

Unless you pump iron, you will lose muscle, as you lose muscle your metabolic rates slows, this causes your body fat to increase, as this increases your risk of diabetes and other health problems related to being overweight or obese increases as well (i.e. hypertension, high cholesterol, etc). The combination of muscle loss and weight gain is a problem as now you are heavier and weaker—a bad combination! Instead of having a V6 engine in a light sports car body, now you have a 4 cylinder engine in an SUV size body. This combination makes you less able to perform daily activities (i.e. mow the lawn) so you struggle to perform even the simplest tasks (i.e. getting up off the floor or sit to stand

transitions) with the next step being institutionalized care. This is not a pretty picture for sure. Certainly, all of us are vulnerable to circumstances beyond our control; however, why not sway the trend in our favor away from inability towards health and independence. Lift weights and be strong well into your later years! Staying strong is largely within your control so make an investment in your future and start lifting weights today. You can increase your strength and vitality no matter what your age or current condition. It is never too late to start. Like I tell my patients, "It is never hopeless unless you have given up hope. If you are willing to try and keep working towards your goals you can ALWAYS make progress."

CHAPTER 2: Before we get started--Weight training basics and common questions

How fast or slow should you lift the weights?

"What is proper form anyway?" Proper form with weight training is slow and smooth so that you work the muscle through the entire range of motion. You should always be in control of the weight, not the other way around. Many people who you may have seen in the gym lift completely wrong by bouncing and jerking the weights. They do this in an effort to lift more weight than their peers. Unfortunately, they use a weight heavier than they can truly control and begin to bounce or throw the weight using muscles other than the intended target muscle or by using momentum. In physical therapy we call this a "substitution pattern" or "compensation". Your body is very good at utilizing other muscles to take over if you are overloading a certain muscle group. However, in weight training, a substitution pattern is bad as it means you are "cheating" by working different muscles than the muscles that you are targeting.

A great example this is bouncing the bar off the chest while performing bench press. This is a common "training error". This occurs when a weight is used that is too heavy to be controlled so the person drops the weight like a ton of bricks on his or her chest, bounces the bar and then quickly springs the weight back up. The problem is that the muscles are not really working that hard because gravity moves the bar downward and when the movement is done quickly, it does not require much muscular effort. Likewise, the bounce off the chest helps to propel the bar in the other direction at the bottom of the movement and then momentum carries the bar upward with minimal muscular effort. No doubt, this does allow one to lift more weight, but it is at the sacrifice of proper form and carries an increased risk of injury to the rotator cuff muscles of the shoulder.

Unlike the lifting described above, proper form is slow and smooth. Ideally, lift the weight to a 1-2 count (concentric phase) and lower the weight to a 2-3 count (eccentric phase). Try not to jerk, swing or bounce as you perform the exercise. This will ensure that your muscles do the work and greatly reduce your risk for injury. Looking back at injuries that I or my patients have sustained over the years, injuries usually occurred when an "explosive" element or sloppy form was part of the lifting technique.

Form Fact: Lift the weight to a 1-2 count and lower the weight to a 2-3 count. Slow, smooth and controlled is the way to lift weights to prevent injury. Control the weights or they will control you.

When you lift with proper form you may not be able to lift as much weight but your muscles will work harder. Remember, your muscles really don't know how much weight you are lifting but they do know when they are working hard and that is what makes them stronger—overload. Overload is making the muscle do more than it is used to and is the most potent stimulus for increasing muscle strength.

When you lift slowly your muscles are "on" longer. In other words, the muscle is under tension for a longer length of time and it is this time under tension that also helps the muscle grow. Here is a quick example of time under tension. Let's say you do a set

of curls where you lift the weight to a 1 count and quickly drop to a 1 count. When you are done with 10 reps you would have maybe a total of 20 seconds invested of muscular contraction "on" time during the set. Now let's take those same 10 reps and lift to a 1-2 count and lower to a 3 count. You now have a total of about 40-50 seconds invested of "on" time for that muscle group during the same 10 reps! This is twice the muscular effort as the sloppy and quick set! Wow! No wonder proper form works. Your muscle will feel the difference too. Proper form is the best way to increase the intensity (or how hard a muscle works) of your workouts. It will also help to prevent injury as it will keep you from lifting a weight that you should not attempt in the first place.

There are rare exceptions to lift at a quick and explosive pace. If you are a football player or Olympic weightlifter, the speed or power of the movement has a time element. So to train for this event, the movement needs to be trained fast (i.e. snatch, power clean, dead lift etc). However, for the average person, we will not find ourselves playing for the NFL or participating in the Olympics, so a slower, safer form of weight training is a better way to go to keep your body healthy and injury free for years to come. The goal of this book is to keep you lifting in a safe manner for a lifetime—literally.

Along with lifting slowly and smoothly you should always feel like you are in control of the weight. A good rule of thumb is that *you should feel like you are controlling the weight that you are lifting. The moment that you feel like the weight is starting to control you: beware; injury is lurking just around the corner.*

How many repetitions should you perform?

Generally speaking, perform 10-20 repetitions in good form and with proper speed. If you are just beginning a weight training program stay more towards the 15-20 rep range to give your muscles and tendons time to adapt as well as for your nervous system to "learn" a new movement pattern. After a few months, increase the weight to stay more towards the 10-15 rep range. Usually a weight increase of 2.5 to 5 pounds will do the trick—I suggest increasing weight in the smallest increments possible. Then, 2-3 months later you can again increase the weight slightly so that you are lifting in the 8-12 repetition range. There are certain exceptions (i.e. when exercising your shoulders) but we will cover these later as we discuss specific exercises. With certain exercises, higher repetitions should be used to avoid injury because of a long lever arm situation or the fragile nature of the joint being trained (i.e. shoulder or knees). For these more fragile joints, it is a good idea to perform higher reps (15-20) with lower weights and in strict form. Only increase weight if you are pain free with a given exercise and feel comfortable with a resistance increase. This is your workout and your body, so listen to the subtle cues that your body gives you and do what is comfortable for you. When using a safe resistance with the proper exercises your risk of injury is minimal.

People sometimes get far too concerned over how many repetitions to perform rather than just getting out there and pumping some iron. Ultimately, no matter what repetition range you are in it will have some benefit for your muscles. In fact, in a study of untrained older adults where the difference between exercise groups were the number of repetitions for each exercise, the strength gains were similar between all groups that were training with repetitions from 6 to 15 repetitions.[1] What this demonstrates is that you can make progress with almost any repetition range when you first begin. After

many months, it is advisable to move towards the 8-12 repetition range for continued gains.

Form Fact: Beginners start with 15-20 repetitions for 4-6 weeks and then slowly increase your weight until you are limited to 10-15 repetitions. After many months of training increase weight again to where only 8-12 reps are possible. Progress slowly—it takes time to remodel your muscles.

Keep in mind that the resistance that you use determines how many repetitions that you perform. There is an inverse relationship between the weight that you use and the number of repetitions possible, in other words, the higher the weight the fewer repetitions that you will be able to complete. So it is the weight that determines how many repetitions that you will be able to complete. Select a weight that will allow you to perform the appropriate number of repetitions for your lifting level. A little trial and error will be needed so it is advisable to always be conservative and start with a lighter weight than you think you need to complete all the repetitions. It is a good idea to write down the weight used and repetitions so that with future workouts you can "tune in" the resistance that you are using so it is just right. Many times when working with clients they will be only a few repetitions into a set and exclaim, "This weight is far too light". When this happens they are encouraged to complete the full set of say 15-20 reps. Usually, after completing those last few reps they find that the weight miraculously gets heavier! The last few repetitions of the set should be difficult and require effort but not be so hard that you lose proper form.

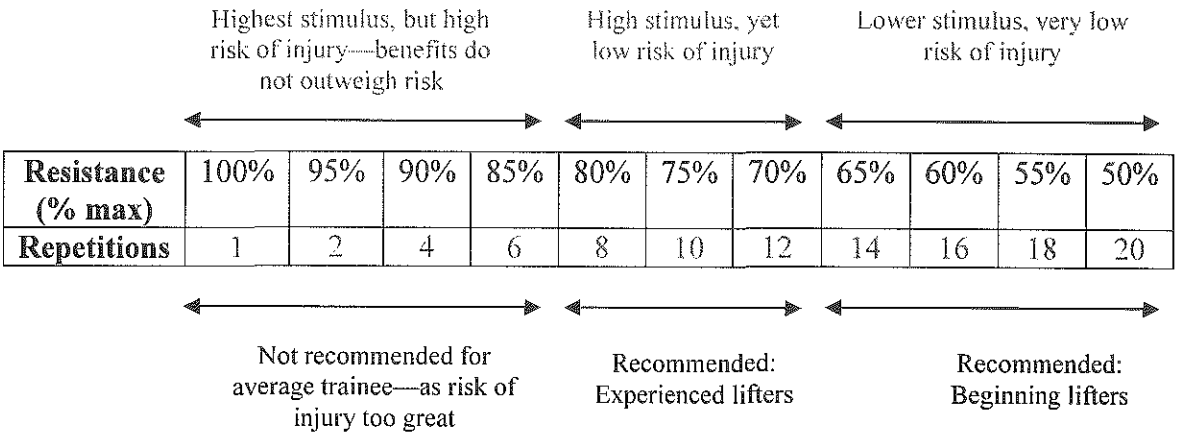
Another important point: before you increase your resistance, be sure that your form has not gotten sloppy. Are you rocking, bouncing or jerking the movement? If so slow it down and keep it smooth and controlled. After a form check, if you are able to complete the required number of reps in good form for all your sets, then it is safe to increase the weight. We all like the feeling of getting stronger but never increase your weight at the expense of your exercise form.

Here is a good table which summarizes the relationship of repetitions to potential for injury—see figure 2.0. Notice that as the weight increases, it decreases the number of repetitions that you can complete but also serves as a more potent stimulus for muscle growth and strength development. However, please note that sometimes the "middle way" is best with weight training so as to avoid injury. Working with weights that have you working in the 8-12 rep range and even as high as 15 will still stimulate strength development but will not carry the same risk of injury as going to a heavier weight.

As we age, ligaments, tendons and cartilage become less elastic, are less forgiving to being overstretched beyond their limits, and will tear causing a painful injury. Therefore, it is important to exercise smart and safe. Working with a reasonable amount of weight that you can control is a great place to start.

Another method of repetition manipulation that can be used is what is called the "pyramid" approach. As the name suggests, with each successive set you use heavier weight hence limiting the repetitions to 15, 12 and 8, respectively. This is a good approach after you have been lifting for many months. The lower weight of the first set enables you to perform more reps so that your initial set serves as a warm-up, but by the

second and third sets, the intensity has built and you are working hard! This is good, though, because your muscles working hard remind them that they can not go on vacation and atrophy (get smaller and weaker).



Resistance (% max)	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%
Repetitions	1	2	4	6	8	10	12	14	16	18	20

Figure 2.0 Resistance and recommended repetitions to avoid injury.

Note: % RM (RM = repetition maximum) is the maximum weight with which you can perform a given number of repetitions. For example, a 1 RM is the maximum weight that you can perform one repetition but not two. Likewise a 75% RM is the maximum weight that you can perform about 10 repetitions. Through research, it has been established that the % RM can be estimated (i.e. 75%) by how many repetition that you can complete at a given weight—you can in a sense work backwards. For example, if you can perform 10 but not 12 it is safe to say that you are working at a 75% RM, without actually testing for your 1 RM. This is a common practice as it allows you to determine what RM you are working out without the risk of injury during a 1 RM attempt.

One of the most frustrating things that can happen to someone while training is injury! It will derail your training, weight loss, or fitness goals and can be depressing. Once you are injured, your training must be modified and sometimes the activity must be temporarily stopped altogether. Nothing is more devastating to your training than to get injured as it short-circuits your exercise goals. I have seen it happen all too often, in what I have called "The downward spiral of injury". You get injured, quit exercising, get depressed, start eating more, put on 10 plus pounds, get more depressed… The next thing you know you feel awful. Perhaps you have experienced this conundrum yourself.

Working out within the proper repetition range and weight will help you avoid the "downward spiral of injury" and keep you moving forward with your exercise goals! Consistency with a reasonable weight that you can perform in good form is more beneficial over the long haul than a heavy weight with sloppy form that hurts you in the end.

Form Fact: Consistency with a reasonable weight that you can perform in good form is more beneficial over the long haul than a heavy weight with sloppy form that hurts you in the end.

How much weight should you start with?

Put simply, the repetitions will guide your weight selection—it really is that easy. You should be able to comfortably complete 10-15 reps in *good form* (no bouncing or jerking) with the last few reps requiring some real effort. However, the reps shouldn't be so difficult that you are sacrificing good form or feel like you are going to give yourself a hernia. If you cannot complete at least 8-10 reps then you need to lower the weight. Beginning lifters should be performing sets of 15-20 repetitions. After you have been lifting for a few months and feel comfortable with the form of the exercises and have a base level of conditioning, then you could increase the weight so that you are limited to 8-15 repetitions. Feel free to vary it up though or "periodize" your workouts. Periodization is merely changing how many repetitions you are performing (through weight manipulation) every few months or so. Even after lifting for years on certain days you may feel fatigued and lift a little lighter weights with a higher number of reps—15-20 rather than 8-12. Other days your energy and strength might be higher so make use of that by bumping the weights up slightly and working in the 8-12 rep range. Variety is a good thing for your muscles as it encourages growth so feel free to mix it up now and then.

When you first begin lifting, it will take a little trial and error to get the proper weight "tuned in" for each lift. If in doubt, always start with a lighter weight than you think you will need. You can always increase your weight the next workout but if you overshoot with a weight that is too heavy for your ability and get hurt then you may own that injury for a while. You should also record your weight and reps performed on the tables that are provided in later chapters so that you can get the weights right each time. Plus, it is fun to see your progress over time!

Form Fact: Use enough weight so that you are limited to the number of repetitions for that set (i.e. 10-15 repetitions) in *good form*. If you cannot complete your reps in good form then the weight is too heavy! Make an adjustment before you get hurt. You should always feel in control of the weights.

Some last practical tips that I like to tell clients is that the weight should feel "moderate". You should feel like it is making you work but not like you are really straining. You should feel like you are in complete control of the weight. Remember, you are controlling the weights; they should not be controlling you. If the later is true then reduce your weight or resistance.

How many sets should you perform for each exercise?

First of all, a "set" is a group of however many repetitions you are performing, for example 10-15 repetitions, until you must rest from muscular fatigue. If you are a beginner, start with one set (or group) of 15-20 repetitions. After a month or two, if you are ready for a greater challenge, then increase to two sets. Two sets is the perfect number for most people although if you are a beginner start with one set. Some research suggests that one can even get great benefits from weight training when performing just one set to the point of muscle fatigue. Perhaps the rule of "some is better than none" applies here.

Perhaps a good way to think of this whole set subject is to compare it to shopping for a car. Typically, when purchasing a car the best value or bang for your buck is in the low end or mid-range models. By the time you add leather, sunroof, heated seats, navigation system etc the cost escalates and the true "value" of what you are purchasing lessens. With sets it is the same thing as the law of diminishing returns is at work. If you perform two sets it doesn't take much of an investment in time and the time that you do invest gives you a very good return as far as strength building. One can perform three to five sets but this takes more time and the strength gained is not proportionate over two sets. In other words, performing three sets instead of two sets, has not been shown to make you 1/3 stronger in 1/3 of the time. Actually, the benefit of three sets gains over two sets is modest but if you have the extra time three sets will encourage extra strength improvement. However, keep in mind that it is better to commit to performing one to two sets and be consistent than perform three sets once a month! Consistency is everything!

Form Fact: Start with one set, if you are a beginner, and then progress to two sets of each exercise after a month or two. You can work up to three sets if that becomes easy and you want to challenge yourself further.

After many months or years of weight training one can perform up to three sets if you find that your muscles have adapted to the two set method of weight training. After years of weight training your muscles may reach a plateau so at this point you can decide if you need to change your routine to a higher volume/multi-set approach. Time certainly becomes an important factor in this decision.

Actually there is an ongoing academic battle over how many sets to perform. There is the single set camp on one side and the multi-set camp on the other. The research has shown that both methods work although most research occurring after 1998 would suggest that the multi-set approach will build more overall strength.[2-10]

Without getting too involved in this discussion it will suffice to say that three sets does appear to build slightly more strength over the long haul than one set, but for the average person, it could be debated that the extra time involved might not be worth the extra effort. Performing two to three sets seems like reasonable advice given the research. However, if you are pushed for time and it is a matter of one set or none—then go with one because there is plenty of research to show that it works too![11-16]

In the final analysis, your body just wants to move and experience some resistance without getting involved in the debate of how many sets to perform. Your body just wants to move. Please do not let the details distract you.

How long do you need to rest between sets?

Rest about 60 seconds or up to two minutes between sets. This gives the muscle enough time to recuperate so that your form for the next set is good but not so much time that the muscle is completely recovered. In a sense, you are trying to "stress" and overload your muscles so it is helpful for muscle growth if you tax them again with another set before they have completely recovered.

Form Fact: Rest about 60 seconds or up to two minutes between sets. If you don't like resting between sets or are short on time alternate muscle groups between sets without rest.

If you find that after resting about 60 seconds, that you are too tired to perform your next set in good form, then rest a little longer—perhaps up to two or even three minutes if necessary. Please listen to your body and respect it at all times. You will likely find that as your fitness level improves the 60 second rule will work well for you.

Now, if you are a power lifter then you may want to rest 2-5 minutes so that you are completely recovered since you are training for maximum strength gains and training with extremely heavy weights in the 2-6 repetition range. However, while this lifting style does make the muscles grow stronger, I have found that it also carries with it a higher risk of injury due to heavier weights that are used. Keep in mind that this book is intended for someone wanting to lift weights through life without injury—not to be the next Olympic power lifting champion.

What if you get bored between sets? Perhaps all that standing around just is not for you. If you find actually resting between sets is boring or if you simply need to be more efficient with your time, you can perform another exercise working a different muscle group or stretch. For example, you could alternate without rests between bench press and rowing. While benching you are using your chest muscles and while rowing you are using your back muscles while your chest rests. You can easily perform sets back to back as long as you are not so fatigued that your form gets sloppy. Another variation of this is to perform an upper body exercise directly followed by a lower body exercise.

Resistance Progression: When can you add more weight and how much?

The answer to this question depends on what level of experience you have with lifting weights. If you are a *beginner,* then once you can complete your sets of 15-20 reps and the 20th repetition is relatively easy—you feel like you could squeeze out a few more reps—then it is time to increase your resistance. On the other hand, if you have been lifting for many months or years and are currently lifting with sets of 8-12 reps, when you can easily complete 12 reps then you are ready to increase your weight. In summary, increase your repetitions first and then your weight. Progressing in this manner will help minimize your risk of injury and keep you lifting for years to come.

Keep in mind that this rule assumes that you are using proper technique and form with your lifts. Many times when you think that you are ready to increase your weight, if you check your form first you will find that you may be moving the weight too quickly or are adding a little bounce or jerk in the movement so that momentum can help you—you are cheating. However, if none of the above training errors are occurring then you have truly gained strength! Congratulations go ahead and add some weight!

Form Fact: When you are able to complete the last few repetitions of ALL sets, with proper form then you are ready to increase your resistance. This will temporarily make completing all your reps for all sets not possible. (For example, if you have been performing two sets of 15 reps and then increased your weight, now you may get 12 reps your first set and say 10 the second set. Don't increase your weight again until you can complete two sets of 15 reps.)

When you do progress your weight do so in the smallest increments possible which is generally 2.5 or 5 pounds depending on the equipment that you have available. One company even sells some magnetic "snap on" 1 ¼ lb weights that snap onto each dumbbell end to create a 2.5 pound split rather than just jumping 5 pounds up to the next weight. It is good to consider the muscle group that you are using when considering how much weight to add. For example, upper body muscles are relatively small and easily injured, so the 2.5 to 5 pound incremental increase is about right. However, our thigh and leg muscles are quite strong and can handle 5 to 10 pound weight increases without difficulty.

All this talk of reps and sets: Are you confused yet?

Table 1.0
Summary Table of Sets and Repetitions

	Sets	Repetitions	Rest between sets	Sets/muscle group
Beginner	1-2	15-20	1-2 minutes	1-2
Intermediate	2-3	10-15	60 seconds	4-6
Expert	3-5	8-12	60 seconds	4-12

Frequency of Training: How many days should you lift per week and how much time do you need for recovery?

The answer depends on how intensely you lift weights and partly depends on your age and fitness level as well. The harder or more intensely people lift weights, the more time their muscles need for recovery. Also, the older people get, the more time they need for recovery. It seems reasonable that an 18 year old can recover more quickly than a 90 year old (and yes, 90 year olds can and should lift weights!). But what makes this interesting is that our recovery ability functions on a continuum or sliding scale of every thing in between. Given this information one may need to experiment to find the

optimum training frequency. However, there is some research to help point us in the right direction. Similar to the dilemma regarding number of sets, the research shows that any amount of resistance training has positive benefits. However, there are recommendations that optimize those benefits.

Many textbooks have recommended strength training three times per week.[17-20] Researchers have also found that strength training two times per week may be equally beneficial as three sessions per week for increasing strength.[21-23] Still another study demonstrated that two sessions per week are 90% as effective as three sessions per week.[24] Yet another study showed that weight training three times per week is superior to training one time per week although this same study found that even one session per week produced significant strength gains as well.[25] Other research showed that in older adults, once or twice weekly training programs produce strength gains similar to three times per week.[26] To help summarize some of this data, a meta-analysis was performed and the results showed that untrained individuals (beginners) gained the most strength with training three days per week in the 15 rep range, while recreationally trained athletes did best with two days per week training with sets in the 8 rep range, and high level athlete populations did best with two day per week training in the 6 rep range.[27]

To summarize, what all this research suggests is that no matter how many times you work out per week there are benefits to strength training. However, as your condition improves you may need to work out with heavier weights, less frequently to keep making progress. Please don't get lost in the details. It is best to lift weights 2-3 times per week so try hard to get two sessions in. If you have a busy schedule get at least 1 session in—again some is better than none.

Through my clinical practice, I have seen that people are able to get in 2 sessions per week in the real world. You need to be successful with this program so commit to a reasonable frequency given your schedule. If two times per week is working out well for many months, then you can always increase the frequency of your workouts. Consistency of two workouts per week for a lifetime is better than doing three workouts per week for a month and then giving up! Ultimately, your schedule may dictate your frequency but that is OK—be practical and stick to it.

Muscle Fact: Lift weights two times per week. If you get busy and can only do one that will work but strive for twice. You can even progress up to weight training three days per week on nonconsecutive days. Your schedule may ultimately determine how many days per week you can weight train but some is always better than none!

Lifting weight causes microscopic tears in the muscle fibers even when properly performed. This is why having at least one to two days of rest in between weight lifting sessions is crucial. Strangely enough, it is this "tearing down" effect that causes the muscle to build stronger the next time that it is faced with a weight to lift. It seems so simple on the surface but the muscle building process at the microscopic level is truly amazing. The thing to take away from this discussion is that weight training causes a cascade of events to occur which will give you more strength for work, daily activities and recreation!

Why do your muscles get sore after lifting weights?

It is this microscopic tearing that is believed to be largely responsible for the delayed onset muscle soreness (DOMS) that can be felt 24-48 hours after a workout. This soreness generally peaks about two days after a workout and then slowly resolves. Do not be alarmed when this happens as this is normal. With repeated bouts of exercise, you will find that this stiffness rarely occurs. To help alleviate muscle soreness aerobic exercise such as walking or biking does wonders followed by gentle stretching of the affected muscle group. If 24-48 hours has passed, you can resume your weight training with the same weight or with the weight temporarily reduced as needed to make it more comfortable. If you reduced your weight due to muscle soreness, once the pain is no longer present feel free to return to the previous weight that you were lifting. Basically, anything that you can do to increase blood flow to the muscles will help. Please note that muscle soreness from a workout kind of "feels good" in a strange way. It is dull and achy in nature and can be felt in the muscle belly itself. This is much different than joint or tendon pain which is sharp and usually felt at or near the joint. While exercising through muscle soreness is indicated, when pain is sharp, it is always a sign to stop or find a different exercise that does not cause the pain.

Recovery Tip: For most average lifters 24-48 is adequate time to recover from a weight training workout. However, as your workout and intensity grows you may need to wait a little longer.

Is it better to exercise in the morning or evening?

Although there have been many studies performed on this topic common sense dictates that **the best time to workout ultimately is when you get it done!** For many people, working out in the morning is best as you get it done before the day's distractions and pressures squeeze your workout off the priority list. It can also be very difficult to try and exercise after a busy day as you may find yourself too tired to push though a workout routine.

However, some prefer to workout in the evenings as it helps to relieve the stress accumulated over the course of the day.

In summary, workout when you can! What matters is that you do what works best for your schedule. As the Nike™ slogan touts, "Just do it" and quit looking for reasons or excuses that will keep you from being a success. Pick a time and stick to it—your health needs to be a priority so that you can be the best that you can be.

Muscle Quiz:
Will women get big & bulky muscles if they lift weights?

No way! This is a common question asked by women and female athletes. They are so concerned that lifting weights will make their muscles big or bulky. I always reassure them, "No, you won't get big and bulky muscles." First of all, it takes years of hard work and intense weight training to build large and bulky muscles. Secondly, women lack the necessary levels of testosterone to build massive muscles. Actually, natural bodybuilders struggle to build large muscles and must lift for years before they attain developed muscles. What is deceiving is that many of the physiques that they refer to that are extremely developed have used the help of steroids in addition to hard weight training to build massive muscles. Without this "hormone help" the body doesn't often grow mounds of muscle. Instead, the body is programmed to build what looks right for your body when Mother Nature is left alone.

For the average female weight lifter, developing large and bulky muscles is not a worry. Instead, women can look forward to toned and firm muscles that look great and will function by keeping them strong and mobile for years to come in addition to helping to fend off osteoporosis.

Pamela Peeke, MD made an excellent point on this topic in her book "Body-for-Life for Women."[28] Regarding women building large muscles she explained, "...fat takes up much more space than muscle—about fives times the space, in fact. So the more muscle you build, the smaller you look." She then goes on to explain that when you lift weights, your body uses stored fat to help build muscle. So by lifting weights you will actually lose body fat and get smaller even if your muscles are growing and getting stronger and more toned! Right on! Sorry, you can't use your fear of building big and bulky muscles as an excuse to not lift weights.

Will you get "muscle bound" if you lift weights?

Still others worry about the older myth of becoming "muscle bound". This refers to someone who lifts weights but lacks functional mobility or looks "out of proportion". A good example of someone muscle bound would be an individual who often performs bench press so he has a developed chest but rarely works his back. We have all seen examples of this haven't we? Before you know it he looks kind of deformed because the shoulders are pulled and rounded forward by the strong chest muscles. So in a sense, being muscle bound occurs when you do not balance opposing muscle groups with equal amounts of weight training.

In this book, special attention was given to providing a balanced routine for all the opposing muscle groups. If you are performing two chest exercises, for example, then two exercises for the back are also assigned. Or, for another example, if you are assigned a bicep exercise you are also given an exercise which develops the triceps. When you sculpt your body proportionately with a variety of exercises for each muscle group you will never get muscle bound but instead will have a functional and healthy physique that looks and feels great!

Muscle Fact: When you sculpt your body proportionately with a variety of exercises for each muscle group you will never get muscle bound but instead will have a functional and healthy physique that looks and feels great.

Speaking of muscle groups—what are the basic muscle groups anyway?

Below are the muscles that we are going to work on building! Then we will cover the right exercises to get the job done.

- Chest
- Back
- Shoulders / Rotator Cuff
- Biceps
- Triceps
- Thighs (Quads)
- Hamstrings
- Calves
- Trunk & Abdominals—often referred to as "core" muscles

Below some of the basic muscle groups can be viewed:

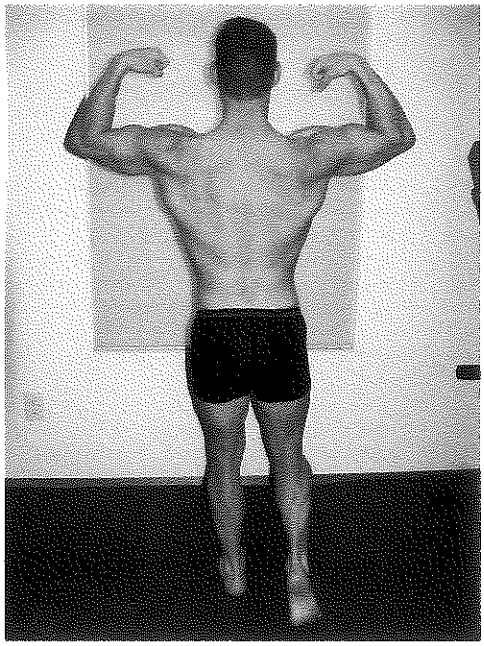


Figure 2.1 Back view of muscle groups

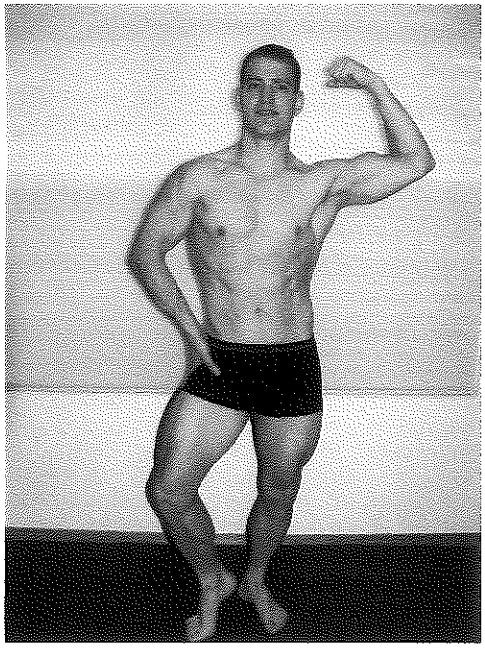


Figure 2.2 Front view of muscle groups

Here are some amazing illustrations by Frank Netter, MD which help to highlight some of the key muscles of the body. You will be working these muscles with the exercises that come in the later chapters—you are truly an amazing creation! Let me help you take care of your amazing machine—the human body. You only get one.

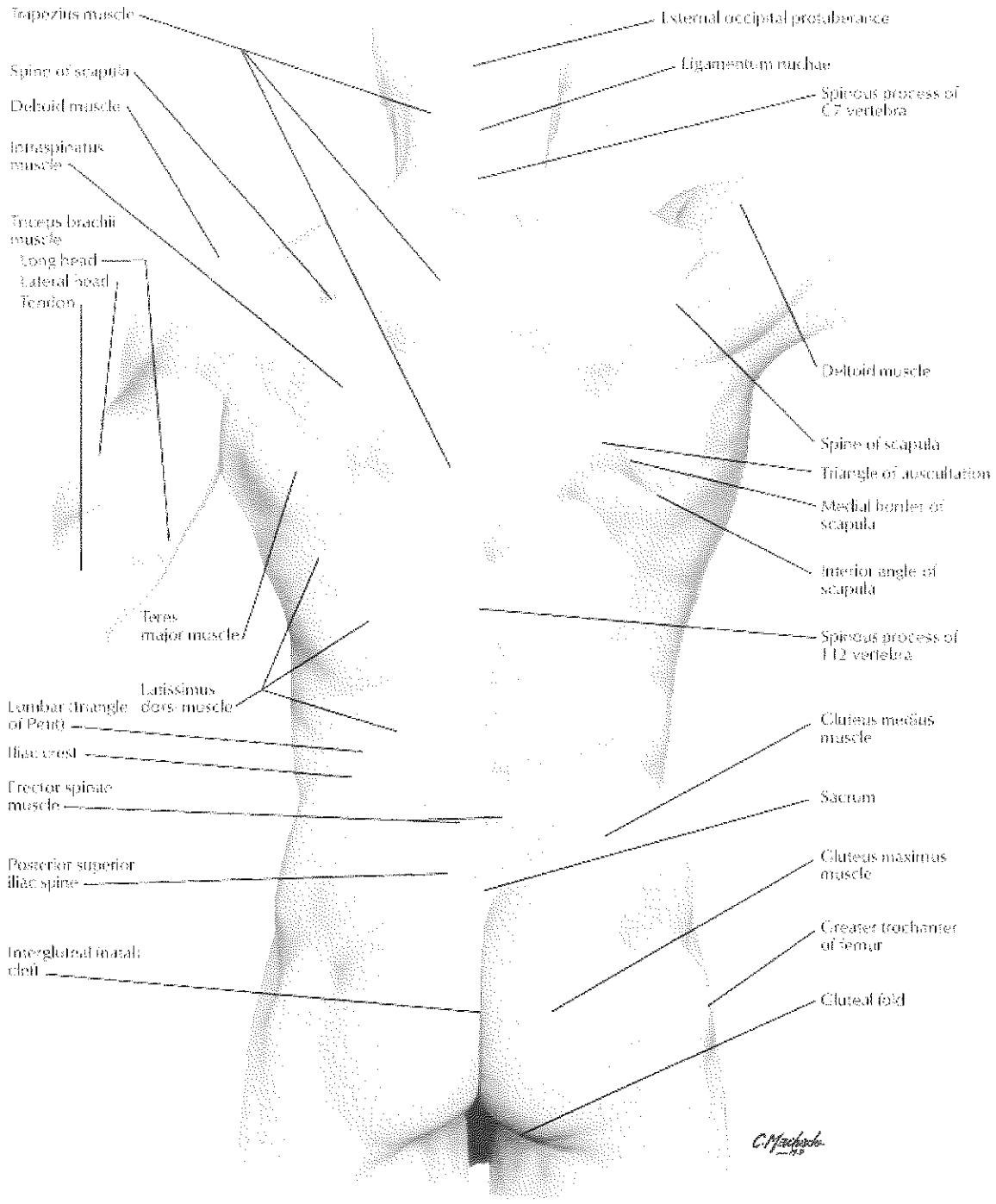


Figure 2.3 Surface anatomy of back. Reprinted with permission—Courtesy of Elsevier, Inc.

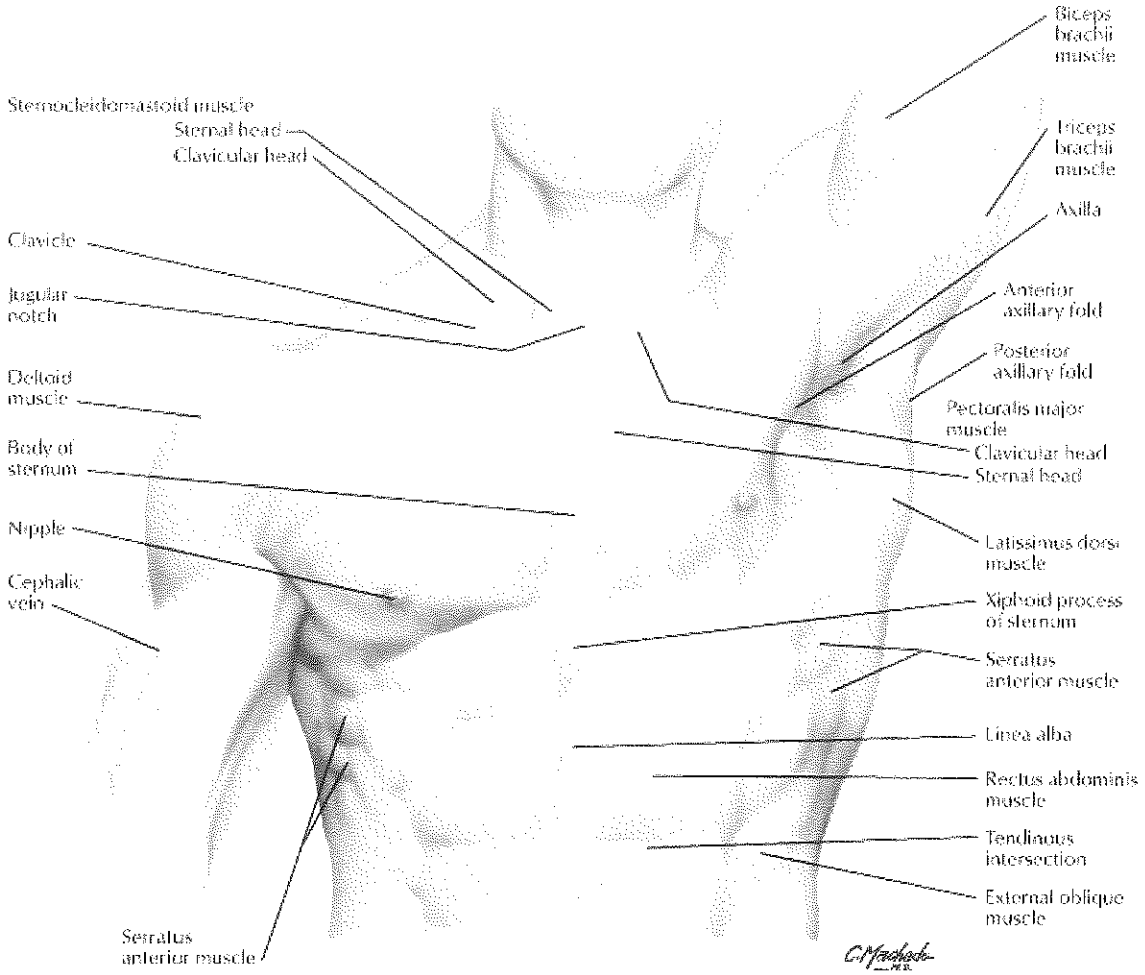


Figure 2.4 Surface anatomy front—upper body. Reprinted with permission—Courtesy of Elsevier, Inc.

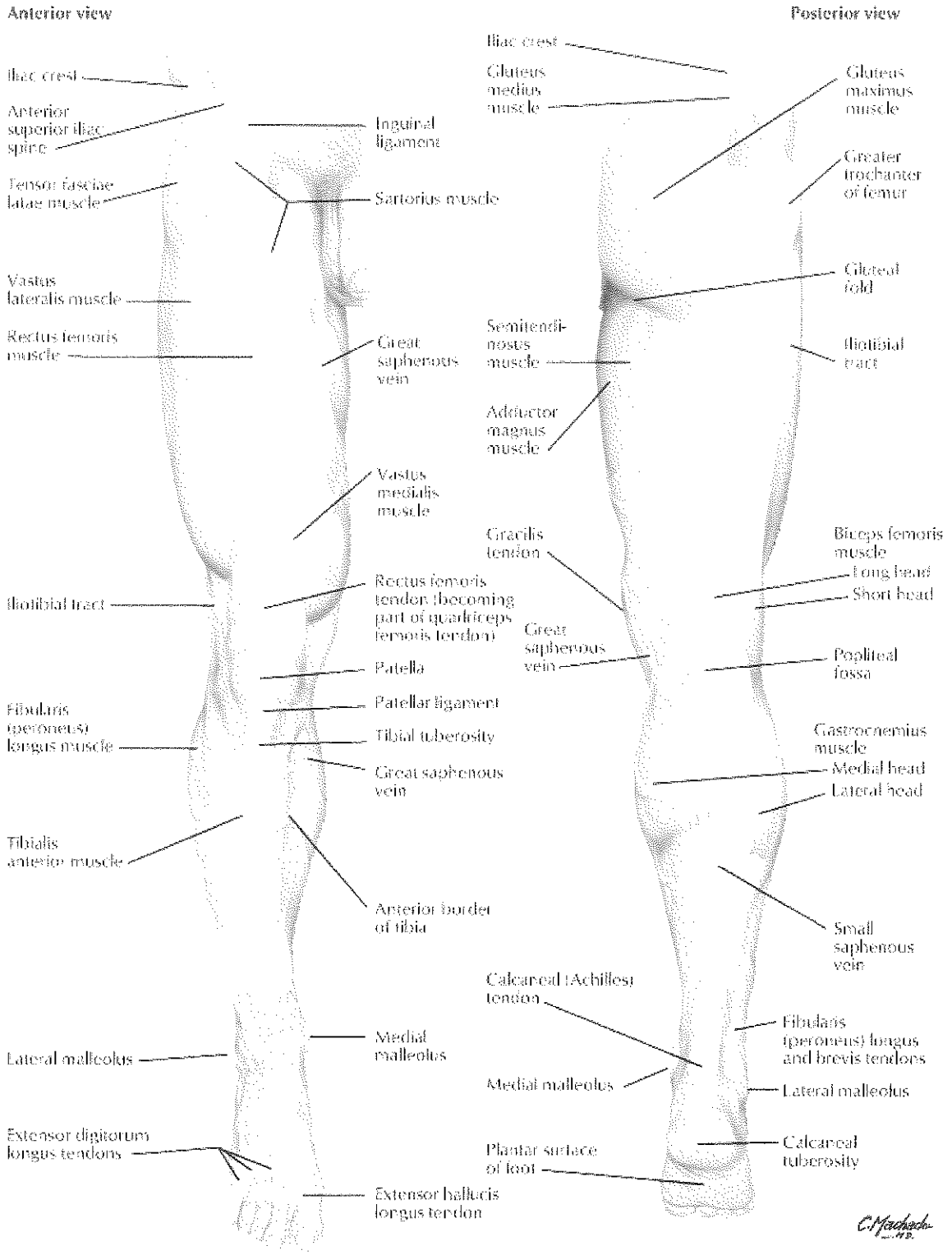


Figure 2.5 Surface anatomy lower extremity. Reprinted with permission—Courtesy of Elsevier, Inc.

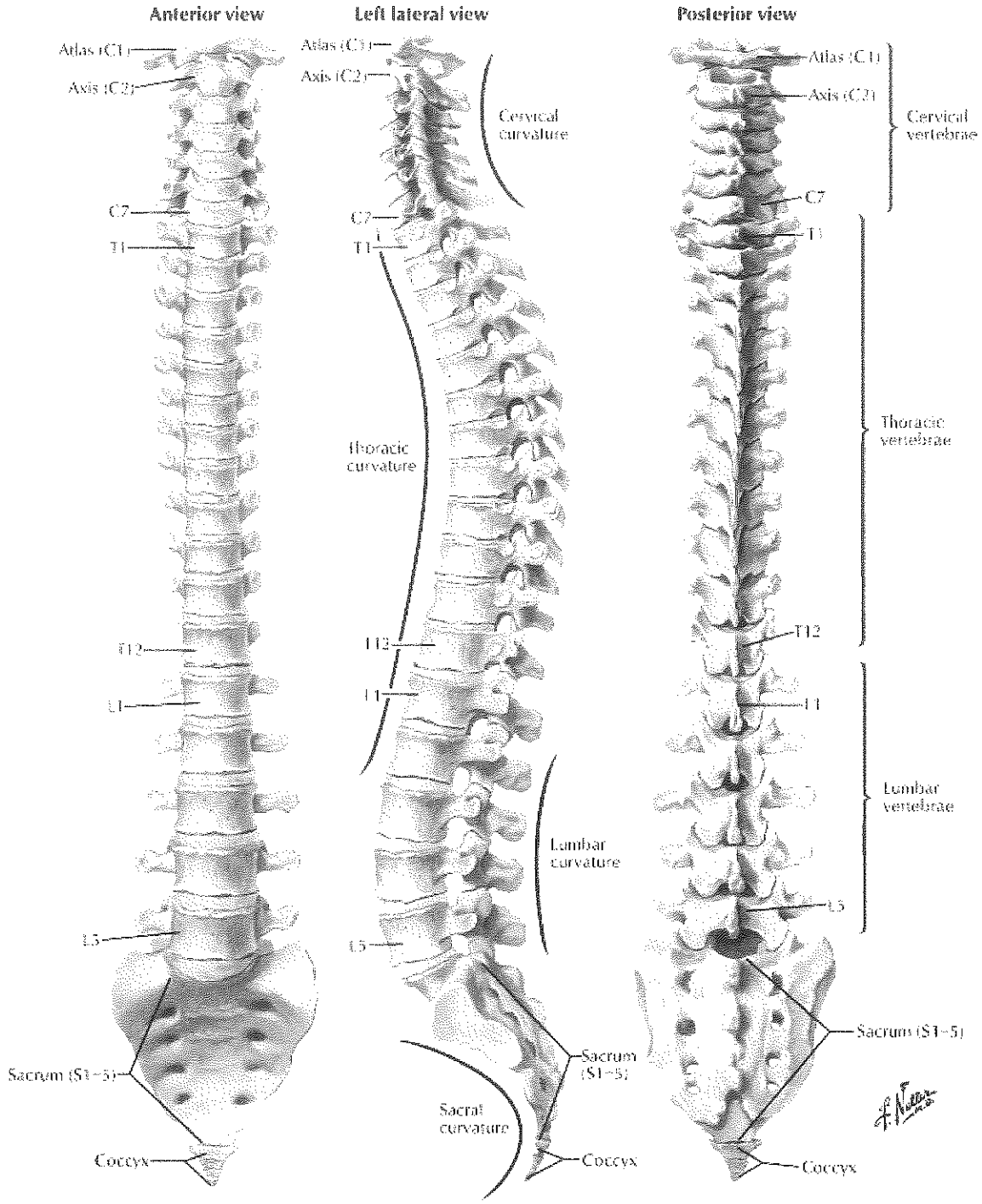


Figure 2.6 Spinal Column. Reprinted with permission—Courtesy of Elsevier, Inc.

How should you breathe when lifting weights?

It is best to *breathe out with the exertion phase* while lifting weights. Another way of saying this is to breathe out while the weight is being lifted upwards against gravity. For example, if you are performing bench press the exertion phase would be while you are pressing the weight up and away from your chest. Hence, you would want to breathe out while pressing the weight away from you and breathe in while bring the bar back down towards your chest.

Remember not to hold your breath as this needlessly increases your blood pressure through the mechanism known as a "Valsalva" maneuver. Always remember to breathe as working muscles need oxygen.

Formulating a Plan to Exercise—nail it down and do it.

Get started:

- **Where? Pick a place**
- **When? Pick a time**
- **How? Stick to your plan—this book will show you how.**
- **Why? For a stronger and healthy body that will serve you for a lifetime.**

Should you workout at home or in a gym?

The choice is yours. Where are you the most likely to get it done? If you answer at home then workout at home; if the gym then that is the best plan. Ultimately, you must decide what is best for your schedule and situation. There is no right answer here as we are all so different in our individual preferences and schedules. In this book, there are programs for those who wish to work out at home or in the gym.

Some people really like the gym atmosphere, support, and follow through better when they "go somewhere" free from distractions. For people who have a difficult time getting motivated, the gym seems to work well. In the gym, others can help carry you along when you feel like quitting. The gym also gives one a large variety of equipment from which to choose—just stick with the safe exercises and progress slowly. Just because you see "an expert" performing an exercise doesn't mean it is right for you.

Others prefer to exercise at home because it is so efficient. You don't lose any commute time and don't have to wait for any equipment as yours is always available. It doesn't take much room or expense to be able to lift at home either. The downside is that distractions can be a problem so you must pick a time of day that will work. I prefer to workout at home due to a busy work schedule. To workout at home all that is needed is basic set of dumbbells (2-10 lbs, 12, 15) to start and a bench press if you wish. If you have room, purchase a piece of aerobic equipment (i.e. Elliptical Machine or Recumbent Bike) and you are set. You now have a complete gym so you can perform aerobic exercise and weights.

Despite what commercials will tell you, it is not the cost of the equipment that will build your body but just using it regularly no matter what you decide. Persistence over time is what creates a strong and healthy body—not gadgets. Money cannot buy a healthy body; instead, it must be earned. I think it is pretty cool that with simple

equipment and a healthy diet you can build a strong body that even a million dollars can't provide! I guess there aren't any short cuts when it comes to getting in shape.

You have probably heard the saying, "Your health is your wealth." How true! Please make an investment in your health whether it is with a gym membership or home equipment. Prevention truly is the best cure. Money spent on improving your health can save you thousands latter in life. Start today and formulate a plan. All you really need is a bench press and a set of dumbbells to start.

"Take your inspiration and turn it into perspiration."
—Jack LaLanne

Why does weight training work?

- Basic **SOAP** rule of exercise:
  - Specificity—the exercise must isolate a specific muscle group
  - Overload—the exercise overloads the muscle so that it is required to do more than it is used to. It is as if the muscle is crying "Help, I didn't even see that one coming!"
  - Adaptation—in response to being "overloaded" the muscle gets stronger and says, "You won't do that to me again!"
  - Progression—this is required once you have adapted to establish a new overload level. This is why eventually you increase the weight…and the cycle begins again.

Summary:

Try to workout with the weights two times per week and you may work up to three if your schedule allows.

- Beginners (new to weight training or haven't lifted for many years):
  - Perform 1 set per muscle group working in the 15-20 repetition range. This workout will go fast and require only a minimal investment in time. 10-15 minutes two times per week.
  - After 1-2 months work up to 1-2 sets per muscle group in the 10-15 repetition range.
  - Remember you only need to add weight in 2 ½ to 5 lb increments to decrease how many repetitions you are performing. Also be sure that your form is perfect before adding weight.
- Intermediate (have been lifting weights for 1-3 months without any pain or unusual muscle/joint soreness):
  - Perform 2 sets per muscle group working in the 10-15 repetition range.
- Advanced (have been lifting weights for 6 months to 1 year without difficulty and are ready for a greater challenge):
  - Perform 3 sets per muscle group in the 8-15 repetition range.

- Note: Even when you are an advanced lifter you may find that for certain exercises that you like to perform more repetitions—say up to 20. Even after lifting for years I personally enjoy do 3 sets in the 15-20 rep range as it just feels good to get the blood flowing and "feel the pump." However, for other exercise I may work down as low as 8-10 repetitions to up the intensity. That is the nice part about weight training is you can always add variety by changing exercises, sets or repetitions.

Perhaps most importantly, enjoy your workouts so that you continue what you have begun. This book is intended to help you construct a reasonable fitness program involving weight training that you can perform safely for a lifetime. Now finally, let us get to the exercises that will help make it all happen—a stronger and more energetic you for work, play and everything in between!

CHAPTER 3: Three Basic Classifications of Exercises--BREAKING IT DOWN—GREEN, YELLOW AND RED LIGHT EXERCISES

Three Basic Classifications of Exercises

As a physical therapist when I work with patients I try to consider their age, current fitness level, current injuries and goals when designing a resistance training program.

Practically speaking, weight training exercises are resistive movements that can be broken down into three distinct groups. The first group, which we will refer to as "**green light**" exercises, should not with proper technique cause injury. When you use proper form and appropriate weight with these exercises, your risk of injury is nil.

The second classification of exercises are what I refer to as "**yellow light**" exercises and as the names suggests you should proceed with caution. These exercises are generally safe when proper form and weight are observed but if you use too much weight or vary your form at all you can be injured. These exercises usually have a higher risk of injury due to longer level arms, excessive shear forces or compressive forces that are placed on the affected joint. If you had a previous injury or have a current injury at a given body region then I do not recommend that you perform the yellow light exercises for that body part.

The third group of exercises are what I call "**red light**" exercises. These exercises are just by their very nature poor exercises at best. You may ask, "What makes an exercise poor"? As a physical therapist, I must daily evaluate exercises in terms of its potential to increase pain versus the benefit of the exercise to help heal an injury—the risk to rewards ratio. So, with these red light exercises I have found that benefits (increased fitness or strength) are not outweighed by the risks (i.e. potential for injury). Some exercises are just bad from the start because they place joints, muscles and tendons in an extreme position in which they were not meant to be loaded (i.e. behind the neck overhead presses or behind the neck lat pull-downs.) A great example of a red light exercise is "bent over good mornings". This is where you bend over at the waist with or without a barbell on your back. The idea here is to strengthen your hamstrings. Although it may indeed strengthen your hamstrings, the pressure that it places on the disks of your back is 10 fold what it would be as compared to standing—in other words, you are just begging for a herniated or ruptured lumbar disk. Ouch! I don't know of too many people that wake up in the morning and begin their morning workout exclaiming, "I think that I will try to herniate a disk today." It is actually pretty ironic that the good morning exercise has great potential to give you a very bad morning backache! This is merely one example of a red light exercise—read on for more information.

The purpose of the next chapters will be to explore each body part, examine the accompanying exercises, and break them down into green, yellow and red light categories. Then some sample workouts will be given depending on your level of expertise: beginner, intermediate or advanced. You can also pick the right workout for your schedule. The beginner's workout is quite short requiring only a 10-15 minute commitment twice per week or later you may opt for the more advanced workout requiring 45 minutes. Some is better than none, so pick what is right for your schedule so you can be successful. With regards to the exercise classification system, if you decide to perform a yellow or even red exercise (which I do not recommend), at least you will be

informed and if you get injured you will know which exercise may have been the cause! This is a powerful thing as it places you in the driver's seat of your fitness instead of relying on someone else who may unknowingly have you perform an injury prone exercise in the first place!

What really sets people back in their pursuit of health and fitness is injury. If you get injured you are not training and if you are not training you are losing ground. The next step, in this downward cycle, is weight gain and then often people get depressed which makes the whole cycle even harder to get out of. It is better to exercise in a reasonable manner and stay injury free. Over the long haul, it is injuries that will short circuit your fitness goals unless you follow a structured and well thought out plan. I see this ever day in the clinic, people trying to lose weight or get in shape and in the process get hurt—hence the idea for this book—it was patient generated from real life experiences. I hope that this book helps you reach your fitness goals injury free and fills your sails with fresh wind. Exercise should build you up, not get you injured.

How is this book any different than any other weight training book? This book is not just a book with pictures of exercises and which muscles they work—although books which explore this are important and useful. Instead, this book is approaching weight training from a fresh perspective in terms of each exercise's potential to work the target muscle group without causing injury. You want the benefits without the injury!

We should also take a moment to distinguish between "good pain" versus "bad pain". Good pain could be described as burning or fatigue and is felt in the muscle belly. Bad pain is usually sharp or stingy and is felt near tendon insertions or at the joint space. For example, when doing curls your bicep muscle may burn but you should not have sharp pain at your shoulder or elbow.

Since we just finished talking about pain, another problem with certain exercises is that some people can be doing harm to their joints but it doesn't hurt until the articular cartilage is stripped away years later. Then the pain begins! How many ex-college, pro-athletes, and older bodybuilders have you heard about that face joint pain later in life? This can be avoided if you train safe and smart. The key is to stress the muscles without tearing up the joints. Afterall, your joints were meant to last a lifetime under ideal conditions.

All this talk on injury prevention…but what do I do if I do get hurt?

- Decrease the weight and work more in the 15-20 rep range.
- If the exercise still hurts after decreasing the weight then skip that exercise temporarily until it can be resumed again without pain. It may be a matter or days, weeks, or even months before the exercise can be resumed safely. Also consider why you got hurt in the first place. Was your form getting sloppy? Were you performing one of the "Red light or Yellow light" exercises? Did you warm-up properly or maybe you increased your weights too quickly? Perhaps you weren't allowing enough recovery time between your exercise sessions for your body to recover. I see this happen a lot with aerobic exercise. Someone will jog every day instead of doing a little cross training with say a bike or elliptical fitness cross-trainer (EFX) every other day. Remember, your body is made up of cells and fibrous tissue which in turn forms muscles, ligaments and tendons. When you exercise, you are creating microscopic tears in those soft tissues so if

you don't allow adequate rest eventually the rate at which they are torn down outpaces the rate at which they can be repaired and you end up with a painful tendonitis or other painful condition because you body could not keep up with the repair work. It is a hard concept to grasp in our driven society but you are actually getting stronger when you are resting (between your exercise bouts) as this is when your body is building your tissues stronger. However, rest is needed for this to happen.

  - Speaking of rest, generally 24-48 hours are needed between weight training sessions although you can lift weights every day if you alternate muscle groups daily. With aerobic exercise, it is best to alternate impact days with non-impact days. In other words if you walk one day then perform the elliptical machine (EFX), bike or Nordic track the next. Ninety percent of the time when someone comes into the clinic with a lower extremity repetitive use injury (knee, foot, ankle, hip) it is from performing the same high impact activity daily without a day of lower impact day for the body to recover. If you really stop and analyze it, it is fairly simple to prevent injury. The problem is that we all tend to think at one time or another that we are "bullet proof." Now don't get me wrong, there are some individuals who can perform high impact activity every day (i.e. running), however, they are more the exception than the rule and their day of reckoning may still be yet to come—say tuned!

- Continue to perform all other exercises that you can that do not hurt.
- Staying active will help pump blood to the injured area and help it heal. Rarely is complete rest recommended for healing to occur, except in very severe injuries (i.e. displaced bone fracture). I prefer to tell people to do what I call "active rest". In other words, you are skipping only the activity that is painful but continue with all other activities--business as usual. Don't be afraid to experiment with other exercises to "work around" the injured body part.
- Stretch! Please see the chapter on the basic stretches that we should all perform. If the muscles crossing a joint are tight to begin with (i.e. hamstrings or quadriceps) then you are more likely to have problems with that joint. Makes sense doesn't it?

POWER POSTURE: Make sure you use proper poster while lifting weights!

Although I encourage people to have proper posture throughout their day, it is even more critical while lifting weights to have proper posture so that you do not end up getting hurt. If you are going to load your joints, you need to place them in proper alignment first. There are some basic spinal curves that should be maintained. The most important spinal curve is what is called your "lumbar lordosis". This is the inward curve in the small of your back—see photo below. Keeping the inward curve helps stabilize the spinal pressure on your discs and back muscles. If you lose this spinal curve while lifting then injury is not far away. Lifting weights is a perfect time to remind yourself of and work on having better posture. What you will likely find is that good posture feels good!

When standing while lifting weights, your feet should be roughly shoulder width apart, abdominals contracted, head held high and shoulders slightly pulled back. Put another way, as viewed from the side your ear lobes should be over your shoulders and

your shoulders should be over your hips—stand upright. Am I starting to sound like your mom or grandma? If so, good as they are usually right!

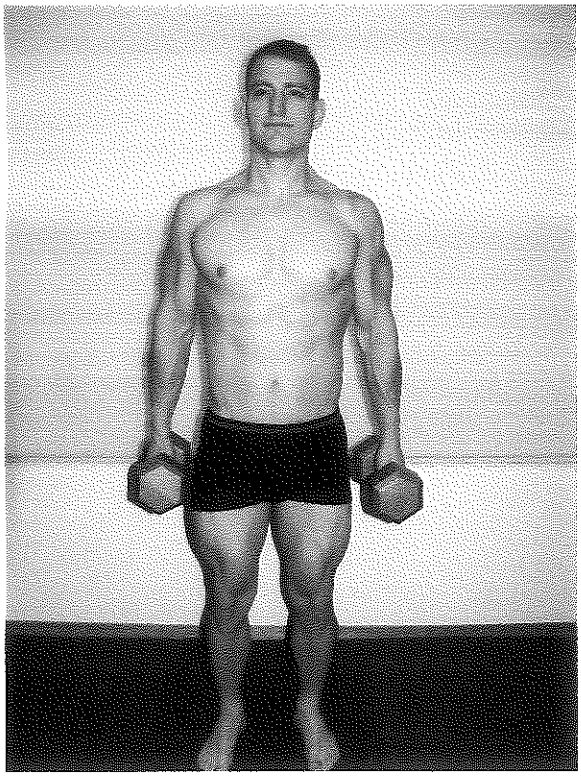


Figure 3.0 Proper posture front view

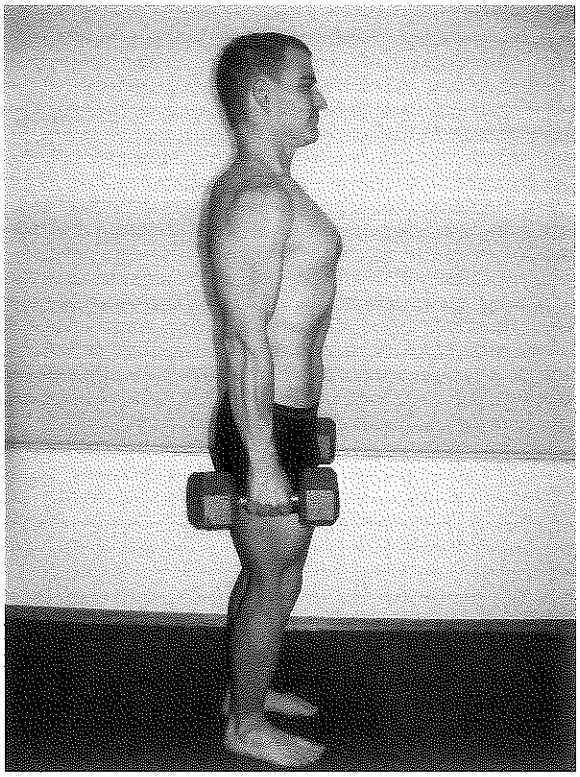


Figure 3.1 Proper posture side view

CHAPTER 4: Green Light "Safe" Exercises—The Best Exercises You Will Find!

These exercises may be oldies but they are goodies! They have been around for a long time but this is because they work and are safe. YOU CAN perform these exercises without injury if you follow the instructions and use proper form. Let's get started and go on a journey to healthier and stronger you. In the exercises to follow there are multiple options listed for each muscle group so that you can pick which ones you want to do depending on fitness level or equipment available.

Myth: You need expensive equipment to build a healthy body.

My firm belief is that you can get a great workout with very basic and inexpensive equipment. Millions are made on exercise equipment each year that is, in some cases, worthless. The best system is often the simplest system and although this is not true in all cases it certainly seems to hold true with free weights. In my opinion, free weights are hard to beat because your body is forced to stabilize itself to perform the movement as you work the target muscle. Weight training with free weights has the benefit of actually helping your balance and this is supported by research! We all need this as balance tends to decline with age. Free weights also allow your body to determine the arc of motion for a movement rather than an engineer in a lab who is making a machine by in large for "one size fits all". I have seen a number of people who have been injured on an exercise machine who were actually using proper form with proper weight but were taller or shorter than "average" so the exercise equipment wasn't a good fit and injury resulted. Do not get me wrong, however, as there are reasons to use machines. They are easy to learn a movement on and do isolate muscle groups. However, on the other hand, free weights are cheaper and more accessible for the average person. Now that's what I call a win, win or a no-brainer!

Weight training with free weights also works your "core" muscles. Abdominal and trunk specific core exercises are great for the spine, however, weight training very effectively trains your core as well because while lifting weights you must stabilize your body with your core muscles with almost every exercise. If you want to strengthen your core pump some iron! Note: Some of my favorite (and of course safe) abdominal and trunk specific exercises are listed in chapter 8.

GREEN LIGHT (SAFE) EXERCISES:

In the pages that follow safe "green light" exercises will be presented for each major muscle group in this order: chest, back, shoulders, biceps, triceps, thighs/quadriceps, hamstrings and calves. Note: Core or trunk musculature training will be covered in another chapter 8. Keep in mind that most weight training exercises utilize many of your core muscles to stabilize the trunk while performing the weight training movement. Weight training is great for your core!

You only need to select one or two of the following exercises for each muscle group in your own workouts. A variety of exercises are presented so that you can pick which ones will work for your routine whether you are at home or in the gym! You can base your workout around the equipment that you have available. Within each section, I tried to start with exercises that beginners can perform with simple home equipment and finish with more difficult exercises which in some cases require gym equipment. In later chapters, suggestions will be given for sample workouts using these exercises.

Please lift safely within your limits and level of experience. If you are a beginning lifter, start only with the green light exercises in this chapter and even then stick with the exercises near the start of each section as these exercises will be more appropriate for beginners. You can always progress to the next exercise if it feels easy but if you make yourself sore then you may quit altogether. With beginning strength training it is always better to err on the side of being conservative. You can always make it harder but injuries are more difficult and costly to undue.

Most injuries occur because they jump into the "exercise pyramid" at too high level before attaining a base of strength or conditioning. A great example, that I like to use because I see it frequently, is a person who sustain a knee injury and then will jump right into a full-blown running program without a base of conditioning first. This happens quite often. It makes more sense to walk or bike for a while to get your muscles stronger. Then maybe you can advance to an elliptical machine or walk-jog off and on. Then after you have had success with all these activities and moved through the rehab pyramid then you can slowly ease into running. The same holds true with weight training. You must start with the basic exercises that are safe and then after a time you can advance to more difficult exercise if you wish. I have tried to build this graduated "exercise pyramid" into my book so you don't have to think about it.

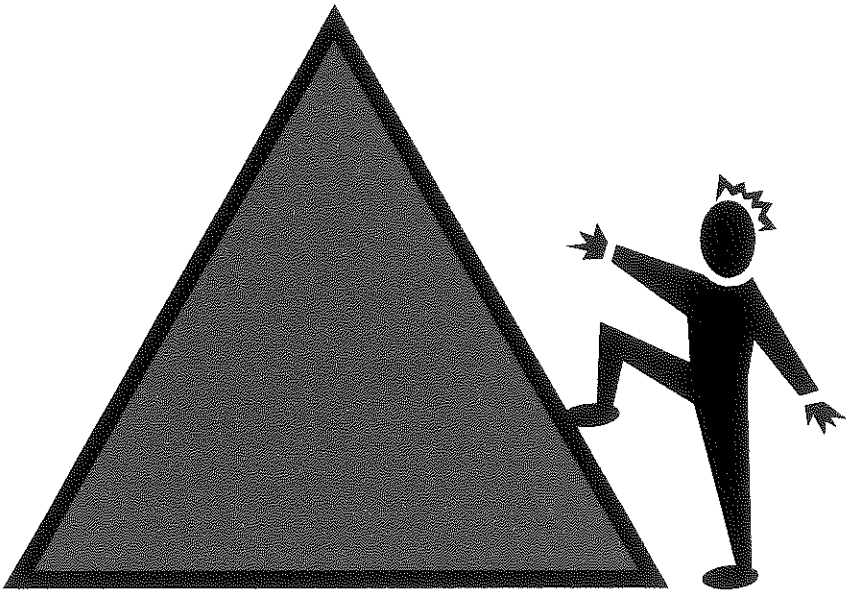


Figure 4.0 Exercise Pyramid

Although the exercises that follow are broken down into major muscle groups keep in mind that no muscle "works in a vacuum". All the muscles do indeed work together at once but it helps from an organizational standpoint to think of weight training in this fashion.

Although the following pages may seem overwhelming, keep in mind that you only need to pick one to two exercises for each muscle group. Take some time to learn the exercises properly and you will later breeze through them in your workouts!

CHEST (Pushing muscles)

Wall Pushup, Ball Pushups, Dumbbell Bench Press, Bar Bench Press

Target Muscle Group: Chest—see figure 4.1 below (or "Pecs" short for Pectoralis Major); pressing movements also do a nice job of working the triceps (or Tricpes Brachii) as well.

Movement: Forward pressing motion—any forward pressing movement will work your chest (and triceps). This is a basic movement that every one should perform on a routine basis.

Bar, dumbbells, machine or bodyweight?: Use whichever you prefer, have access to or what you can do without pain. Many people like dumbbells as they are inexpensive and don't take up much room. Although it's not ideal, you can even get away without a bench press if you must—just use the floor for push-ups or an exercise ball for ball push-ups—some is always better than none! All your muscles need is some resistance to push against.

Common Mistakes (with pressing exercises for chest): Out-flaring elbows and bouncing the bar at the bottom of the movement. Don't let your elbows flare away (abduct) from your body more than 45 degrees.[1] With barbell bench press, it is also good practice to not let your shoulders to extend beyond 15 degrees from the horizontal or parallel with your body to avoid anterior capsule/shoulder injury.[1] If you have a thinner build and it feels like you may be over-stretching the front of your shoulders at the bottom of the movement then it might be advisable to place a rolled up towel on your chest to limit the depth of the movement. However, if you have a "thicker" or muscular build then the extra roll is not necessary your soft tissue will limit the excursion of the movement for you.

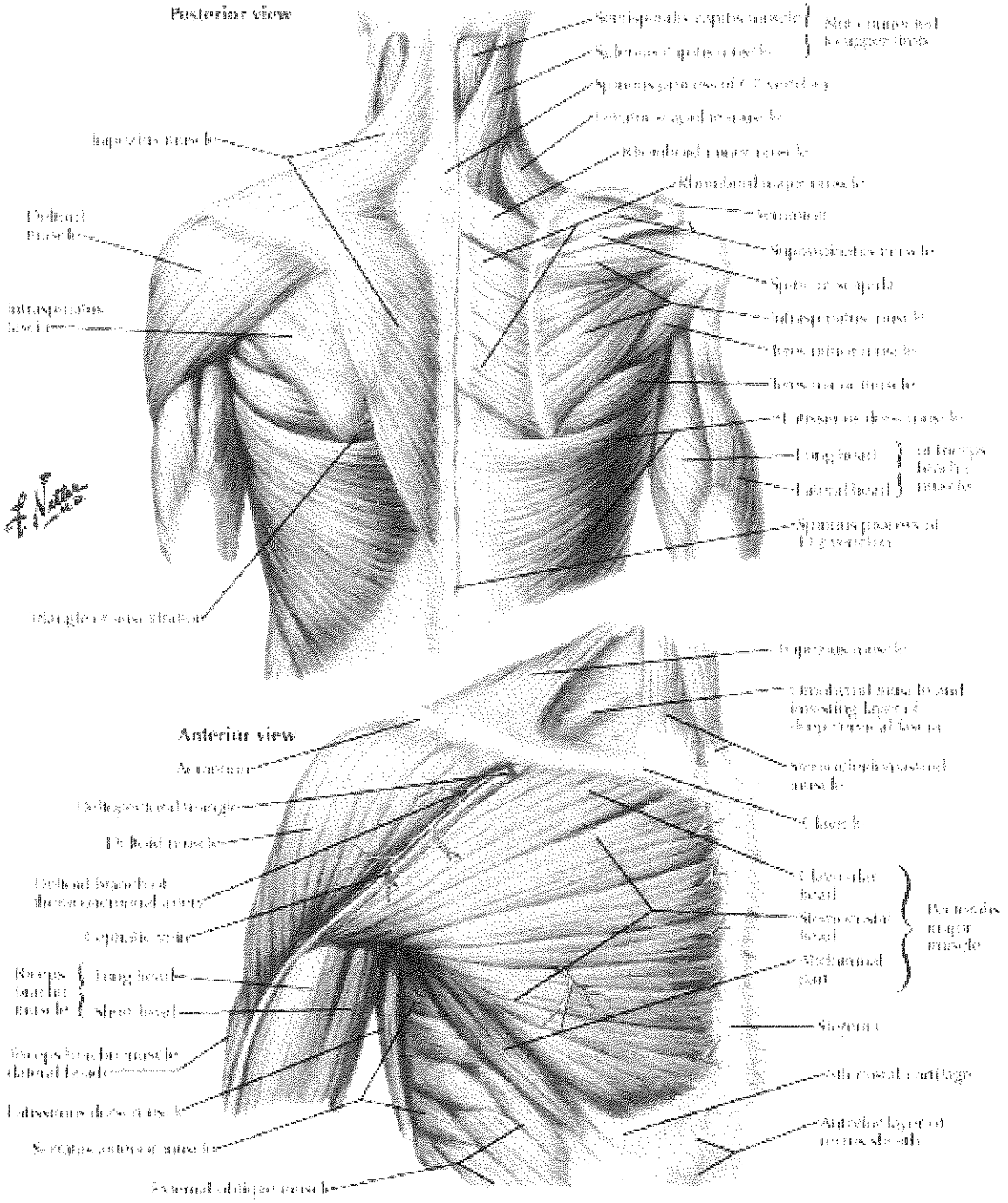


Figure 4.1 Figure showing upper body front and back musculature. Reprinted with permission—Courtesy of Elsevier, Inc.

WALL PUSH-UPS (chest)

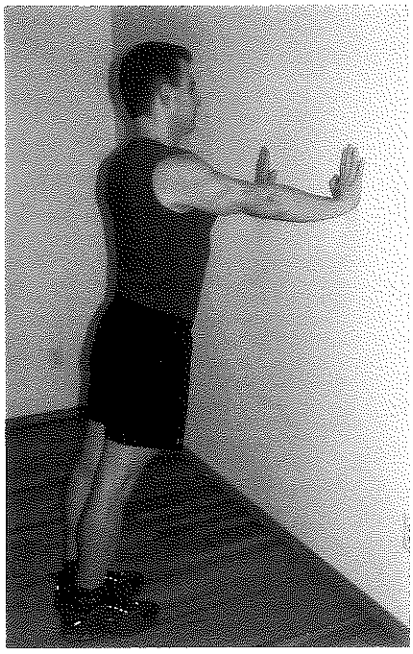


Figure 4.2 Wall push-ups starting position

Starting Position (figure 4.2): Stand away from the wall slightly more than arms length so that you can lean into the wall. Place your hands on the wall in front of your shoulders but slightly lower than shoulder level—this is important because if your hands are higher than shoulder level you will irritate your shoulders with this exercise. When done properly it is very safe.

Midpoint (figure 4.3): Slowly lower your body towards the wall while inhaling and keeping your elbows near your sides. Lightly touch or come close to touching your forehead to the wall and then press outwards as you exhale to return to the starting position.

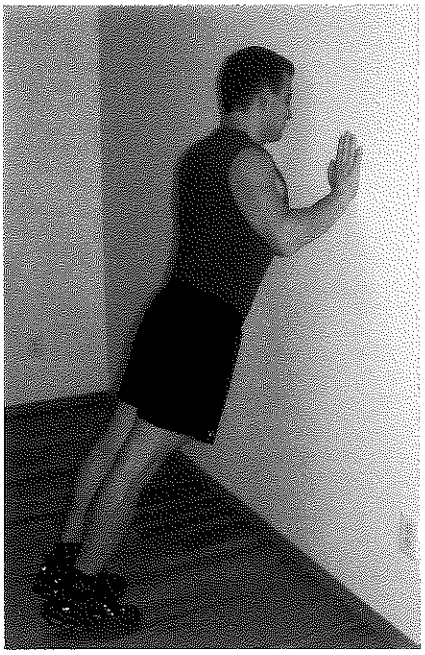
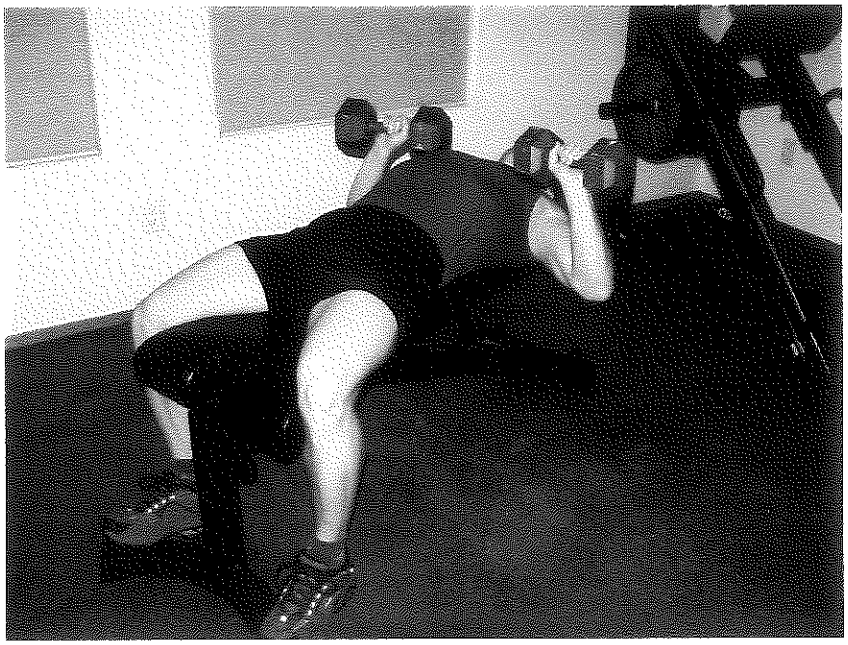


Figure 4.3 Wall push-ups midpoint

Figure 4.4 Tip for wall push-ups

Tip (figure 4.4): Do not have your hands higher than shoulder level as it will make your shoulders sore later (figure 4.4). Keep hands slightly lower than shoulder level as shown in "starting position" picture.

DUMBBELL BENCH PRESS (chest)



Starting Position (figure 4.5): Lie on your back with elbows at about a 45 (or less than 45 degrees) degree angle away from body, palms facing down with thumbs in towards rib-cage.

Figure 4.5 Dumbbell bench press starting position

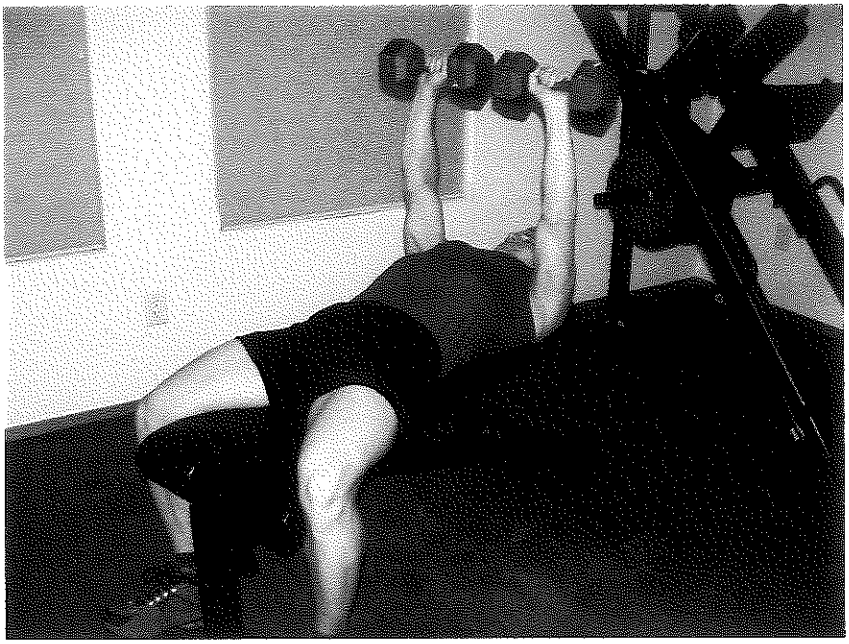
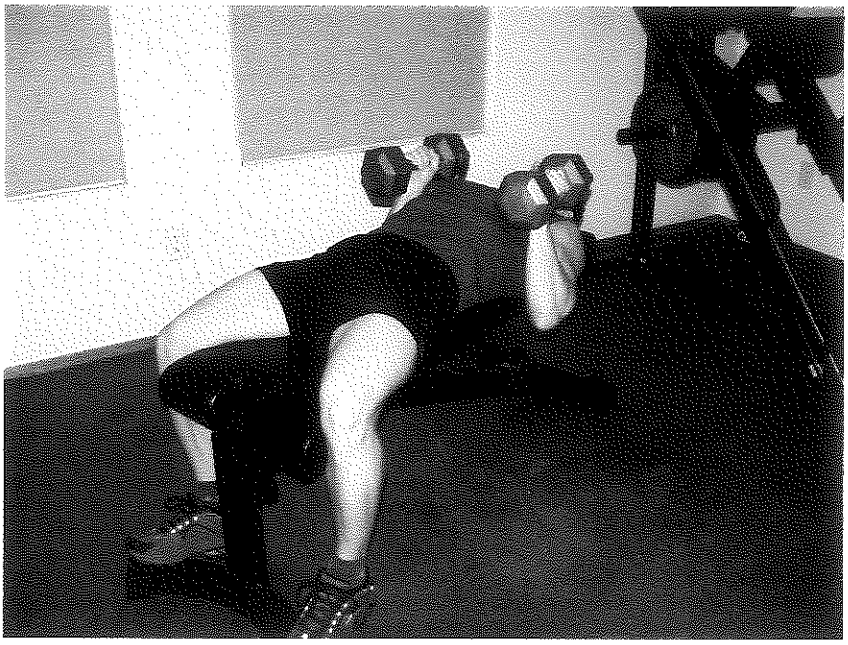


Figure 4.6 Dumbbell bench press midpoint

Midpoint (figure 4.6): Breathe in (inhale) before starting the movement and then exhale as you press the dumbbells directly over your chest. At the top on the movement your elbows should be straight but not hyper-extended or locked. While in the midpoint of the range be sure and squeeze your chest muscles together. Now slowly lower the weight and inhale as you return to the starting position.



Tip (figure 4.7): If your shoulders hurt while performing this movement, try keeping your elbows against your sides (rib-cage) while pressing. This will relieve some of the torque on your rotator cuff.

Figure 4.7 Tip for dumbbell bench press—elbows near sides to decrease shoulder pain or stress on rotator cuff

Tip: Do not arch your lower back. Place your feet on the end of the bench if needed.

Tip (figure 4.8): Do not allow your elbows to flare away (abduct) too far away form your body as it can lead to shoulder tendon irritation or worse yet injure your rotator cuff.

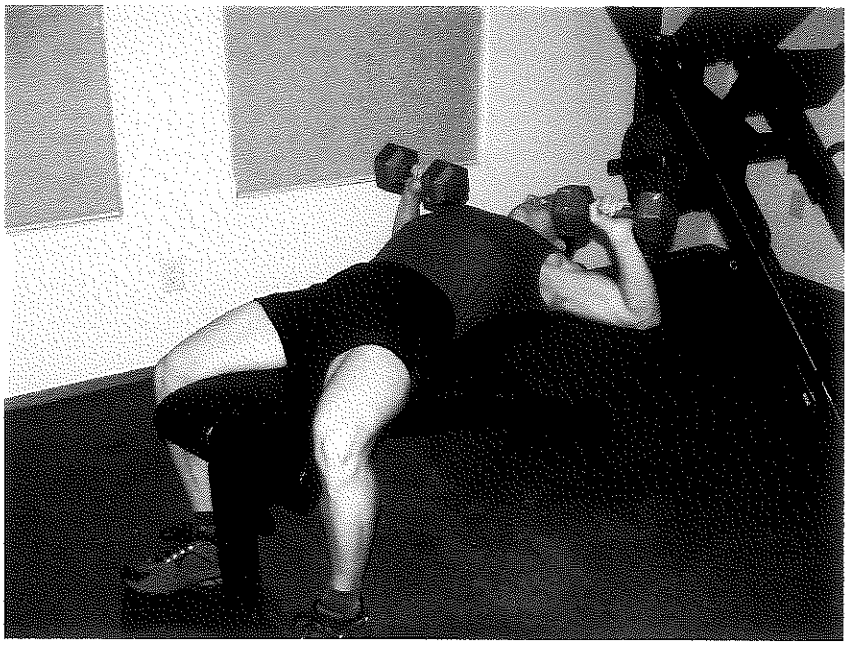


Figure 4.8 Tip for dumbbell bench press—arms too far out to sides increasing risk of injury

BARBELL BENCH PRESS (chest)

Starting Position (figure 4.9): Lie back on a bench with your feet planted securely on the ground in a wide stance so that you have stability. Grasp the bar so that your hands are above your shoulders or slightly wider than shoulder width. Just as with dumbbell bench press, do not allow your elbows to flare away from your body more than 45 degrees so that you protect your shoulders. Hold the bar directly over your chest with elbows straight—use a spotter as need for safety or a Smith machine.

Figure 4.9 Barbell bench press starting position

Midpoint (figure 4.10): Slowly lower the bar to your chest while inhaling deeply. Gently touch down on your chest, without bouncing or relaxing, and then smoothly reverse direction and press the bar to the starting position directly over your chest as your exhale. Remember to exhale with the exertion or the pressing phase as the bar moves upwards.

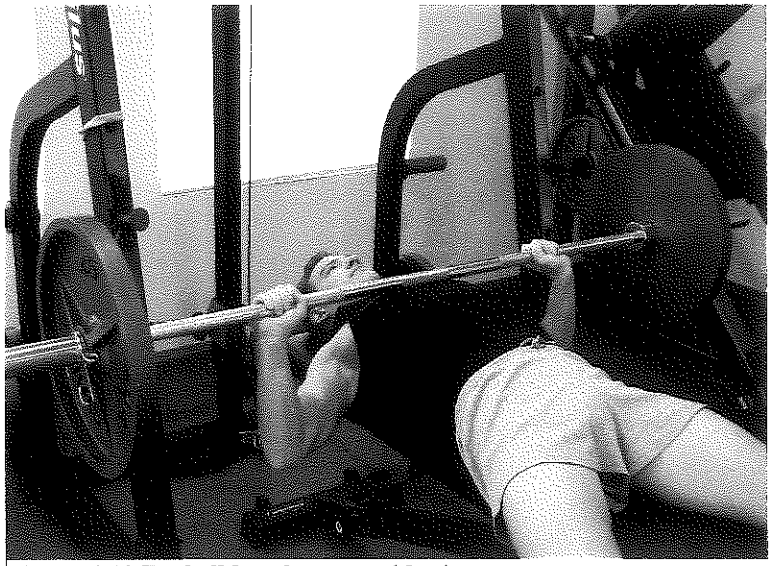
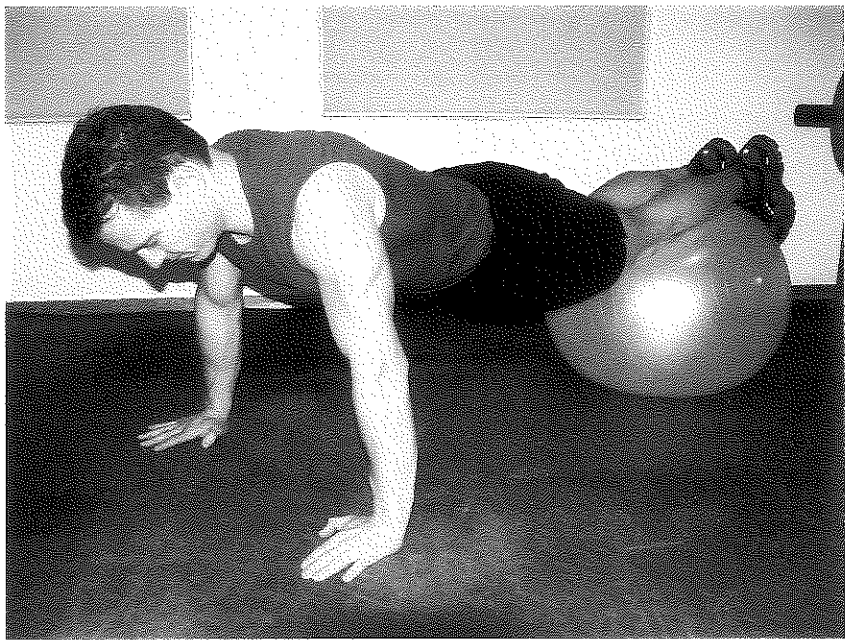


Figure 4.10 Barbell bench press midpoint

Tip: Do not bounce the bar off your chest or lift your hips off the bench by arching your low back. As with dumbbell bench press do not allow your elbows to out flare more than 45 degrees.

BALL PUSH-UPS (chest) or standard push-ups



Starting Position (figure 4.11): Be aware that this is an intermediate to advanced exercise to be performed after you have a base of strength established. Place ball under legs with elbows straight and *abdominals tight*—flex that core!

Figure 4.11 Ball push-ups starting position

Midpoint (figure 4.12): Inhale and slowly lower body towards floor until you barely touch or come close to touching floor. Exhale as you smoothly press to the starting position.

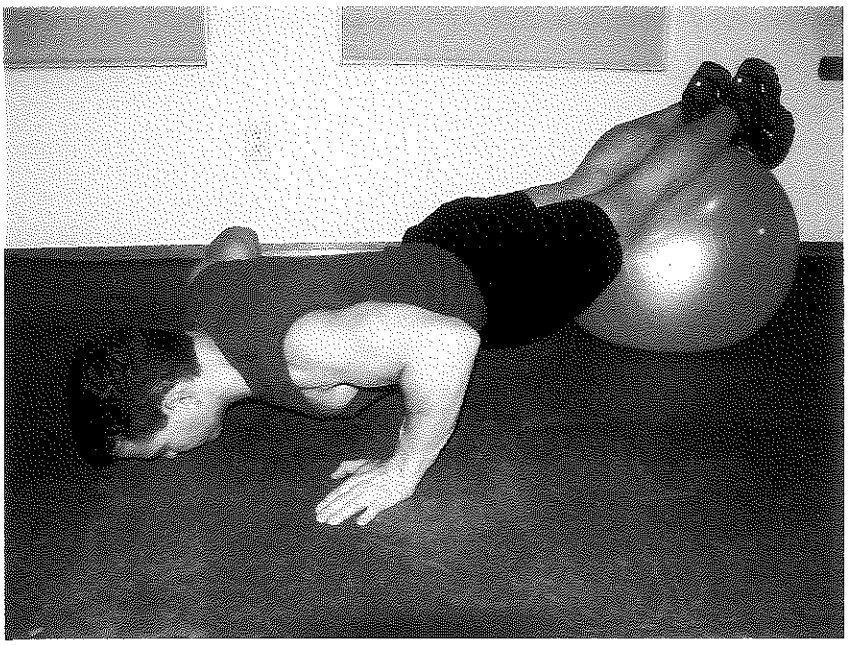
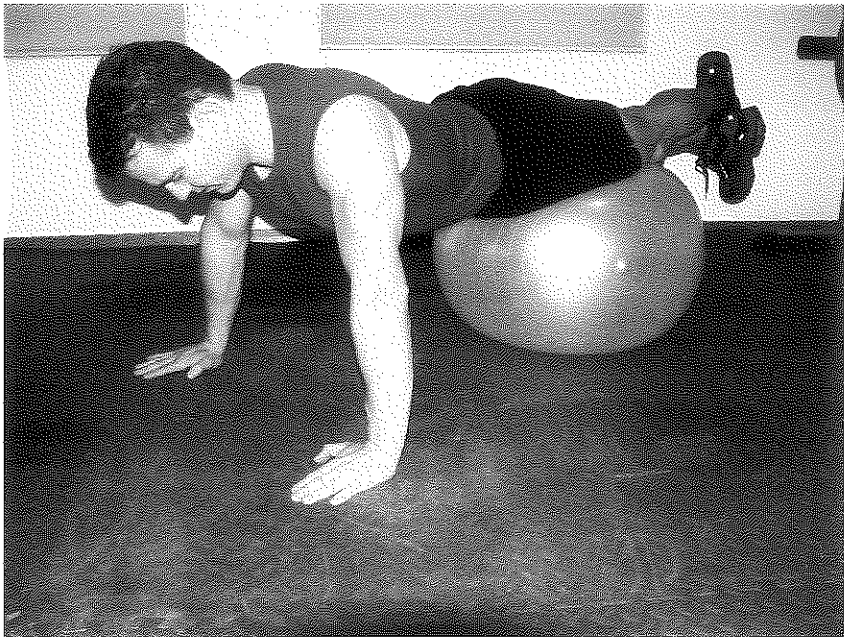


Figure 4.12 Ball push-ups midpoint

Tip: If your shoulders hurt while performing this exercise keep your elbows close to your sides during the movement or switch to modified form below in figure 4.13.

Note: You may substitute standard push-ups for this exercise.

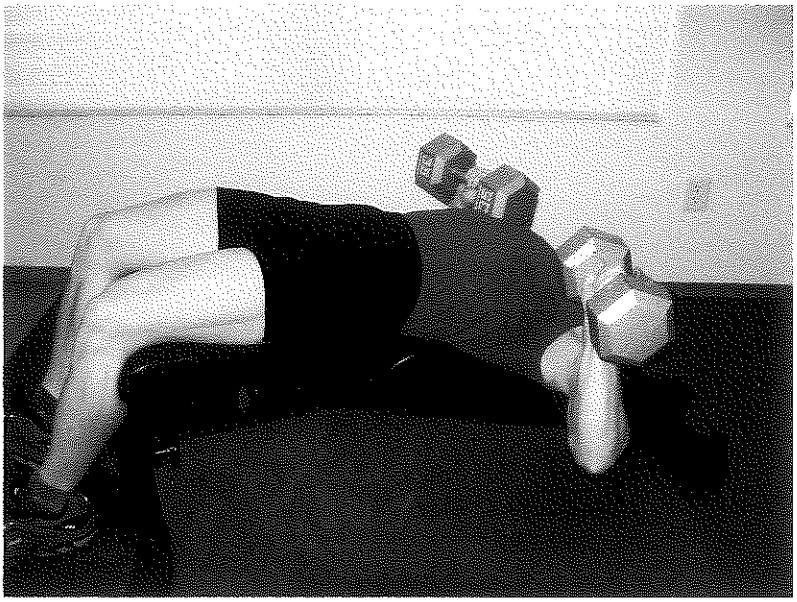


Tip (figure 4.13): If you are a beginner you can perform this exercise if you move the ball from under your legs to under your thighs or hips. This will shorten the lever arm and thus decrease the difficulty of the exercise. I advise starting with dumbbell bench press or wall push-ups first however.

Figure 4.13 Tip for ball push-ups—modified starting position with shortened lever arm with ball placement under thighs or hips

Note: You can substitute knee push-ups for this exercise if you do not have a ball.

DECLLINE DUMBBELL BENCH PRESS (lower chest)



Starting Position (figure 4.14): Sit at end of bench with it slightly declined at about a 30 degree angle. Rest each dumbbell on your thigh and lean back on the bench as you bring each dumbbell to a position over your chest but slightly lower than your shoulder. Pick a weight that you can easily control slightly lower than the flat bench weight that you would use. (You may also use a barbell if you prefer.)

Figure 4.14 Decline dumbbell bench press starting position

Midpoint (figure 4.15): Inhale while you are in the starting position. Now exhale as you press the dumbbells upwards to a position that is slightly below shoulder level. Slowly lower dumbbells to starting position just above or slightly touching chest but not too low—do not overstretch. The exercise should always feel comfortable.

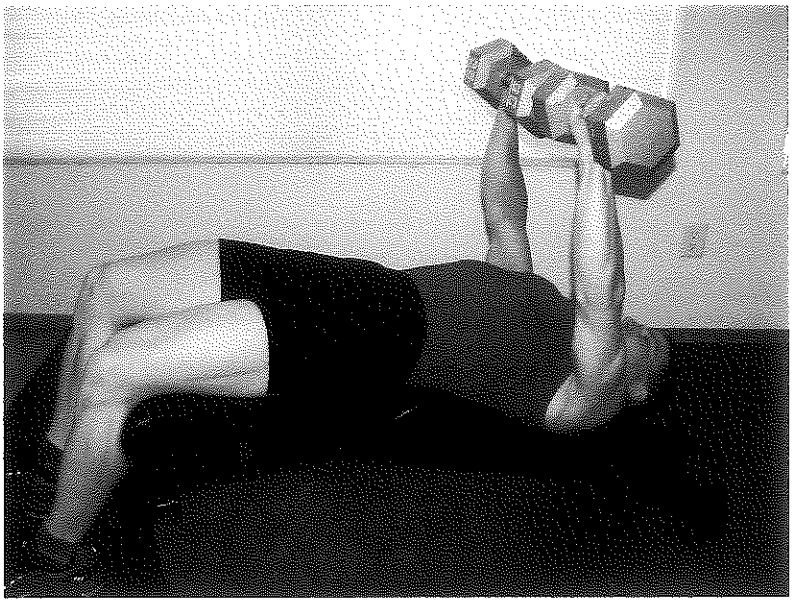


Figure 4.15 Decline dumbbell bench press midpoint

FLYS:

Although dumbbell and machine flys are generally safe I have placed these in the yellow light category because they can induce injury in beginning weight lifters and special attention must be given to form. Therefore, flys can be found in the yellow light chapter. Again, these are safe but I advise people to build a base of strength in their chest before beginning this exercise. A reasonable weight should always be used. With that said know that I do perform dumbbell flys as a part of my regular routine but I do not go heavy and am careful with my form. When working with patients in the clinic I will make sure that they can perform the other green light exercises without pain before initiating flys.

BACK

Just as with the chest you need a pressing/pushing movement, so it is with your back—you need a pulling movement. I recommend a pulling movement front straight ahead to work the muscle fibers that run in a horizontal direction (i.e. middle trapezius and Rhomboids) in your back and a pulling movement from an overhead direction to work the muscle fibers that run in a more vertical direction (i.e. Teres Major and Latissimus Dorsi). If you are in a hurry just pick one back exercise and rotate the exercises every so often. Ideally, however, try and pick one back exercise from each category—one for horizontal fibers and one for vertical fibers.

Generally speaking, when training back or shoulders it is best to keep your elbows in a plane near or close to your sides as this decreases the pressure on your rotator cuff. This is why with many of the exercises to follow I caution you against wide grip activities and move towards medium or narrow grip exercises. Please see figure 4.16 below for a picture of the back muscles that you will be exercising.

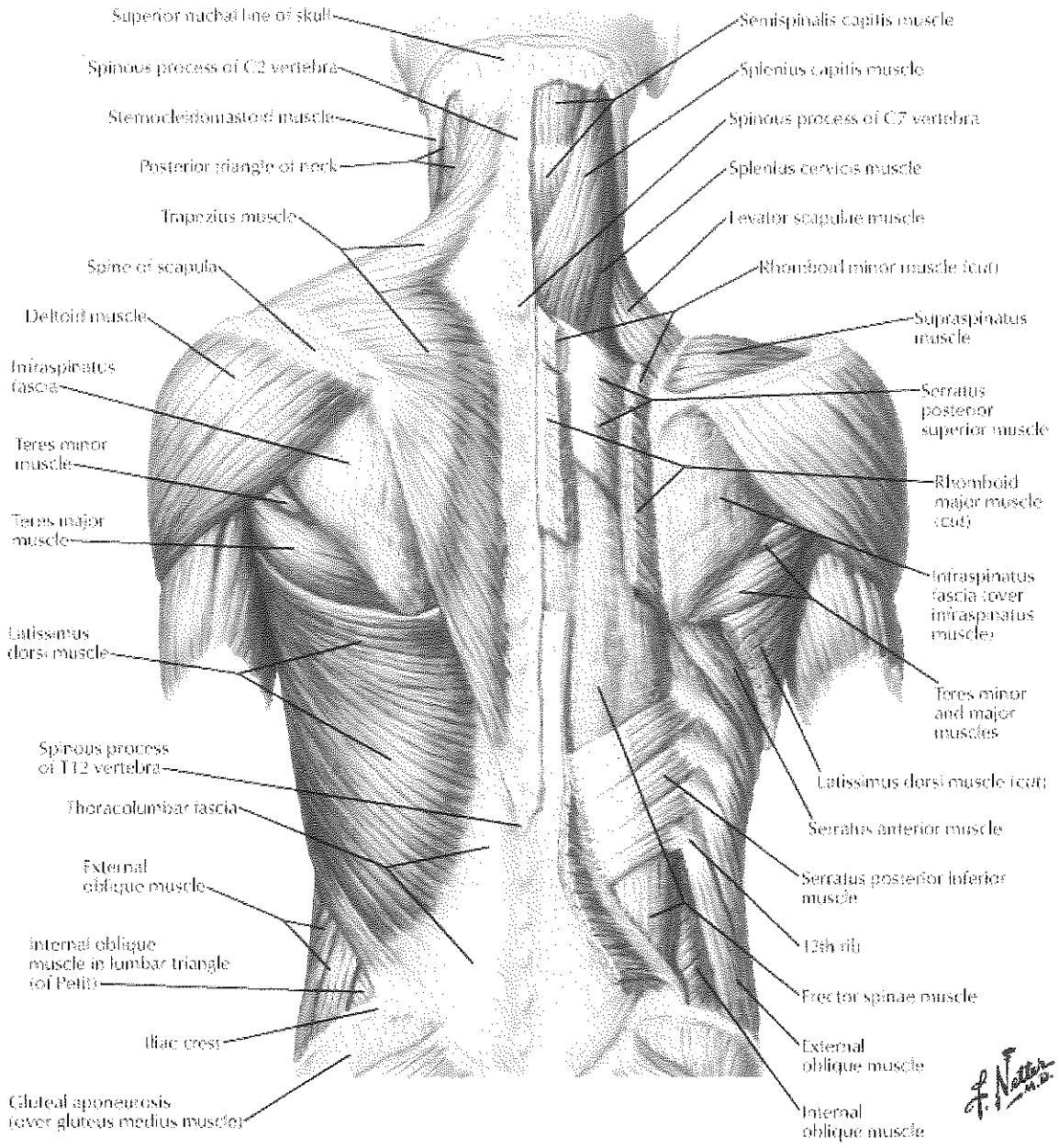


Figure 4.16 Back musculature: Notice how some fibers run in a horizontal orientation while others run vertically. Reprinted with permission—Courtesy of Elsevier, Inc.

DUMBBELL ROWING (horizontal muscle fibers)

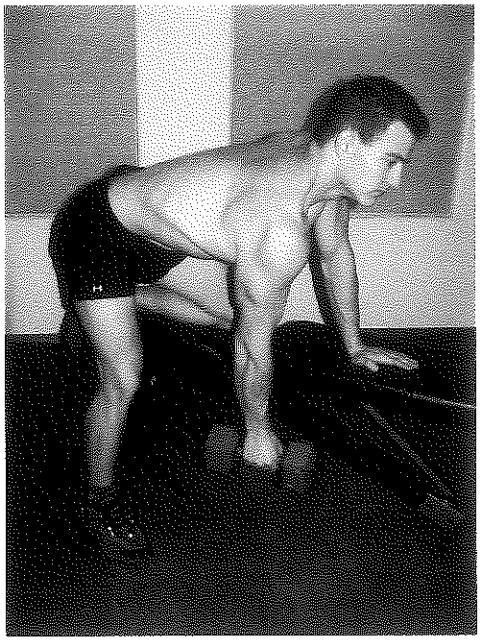


Figure 4.17 Dumbbell rowing starting position

Starting Position (figure 4.17): Position yourself on a bench with one leg on a flat bench and the other foot flat on the floor. Make sure that your spine is straight and be sure and absorb the weight of your upper body using your supporting hand on the bench. The dumbbell should hang almost directly below your shoulder.

Midpoint (figure 4.18): Inhale as you pull the weight towards your chest and shoulder. Focus on squeezing your shoulder blade towards your spine. Exhale as you slowly lower the weight to the starting position. Keep your back straight and abdominals tight as you perform the exercise.

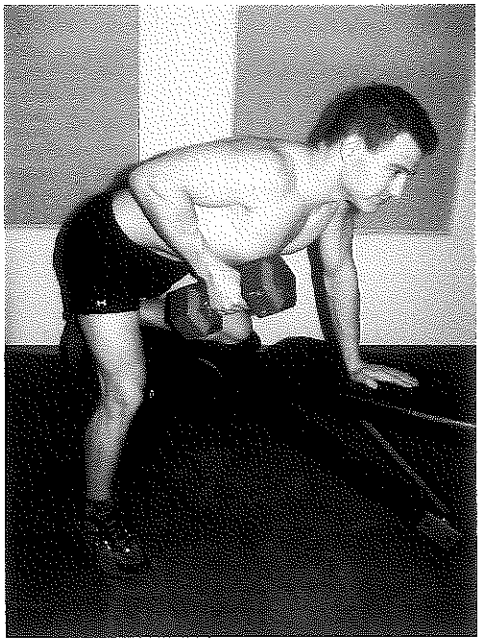


Figure 4.18 Dumbbell rowing midpoint

Tip: Do not round your back as this places unnecessary strain on your spinal muscles and discs.

BAND & CABLE ROWING (horizontal muscle fibers)

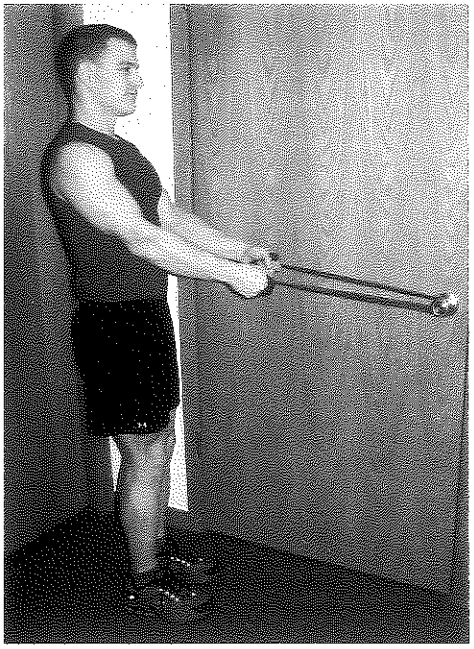


Figure 4.19 Band rowing starting position

Starting Position (figure 4.19): Sit or stand (depending on your equipment) with your feet about shoulder width apart—hook band around door knob. Be sure and maintain the inward curve (lordosis) in your low back at ALL times.

Midpoint (figure 4.20): Inhale as you squeeze your shoulder blades together tightly until the inner parts of yours wrists touch your ribcage. Feel your ribcage expand as you inhale deeply. Pause briefly while squeezing those shoulder blades and then slowly return to the starting position. Keep your elbows and arms near your sides throughout the movement as this places your shoulder joints in a safe position with minimal stress on the rotator cuff.

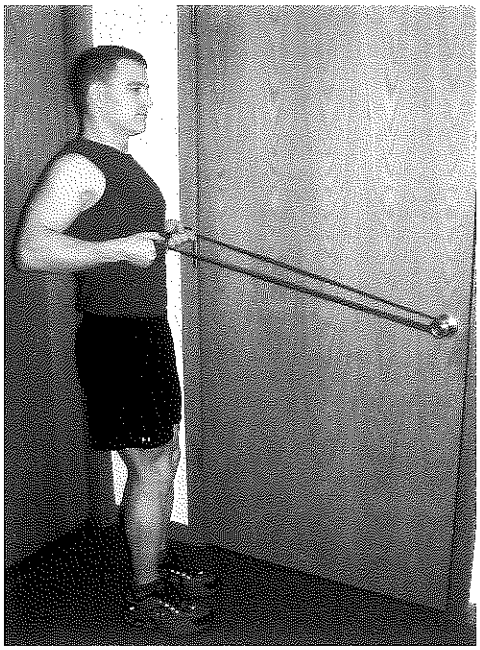


Figure 4.20 Band rowing midpoint

Tip: You can place the band around a doorknob and stand if you do not have access to any equipment. The standing position is also very gentle on your low back. You can purchase a band from any physical therapy clinic—ask for a "medium" resistance or can go online to www.theraband.com to purchase a band as well. The green color—they are color-coded by resistance—seems to work well for most beginners. Some people even use surgical tubing found in the fishing department of your favorite store for resistance. Your muscles really will not care what you are using as long as they are working.

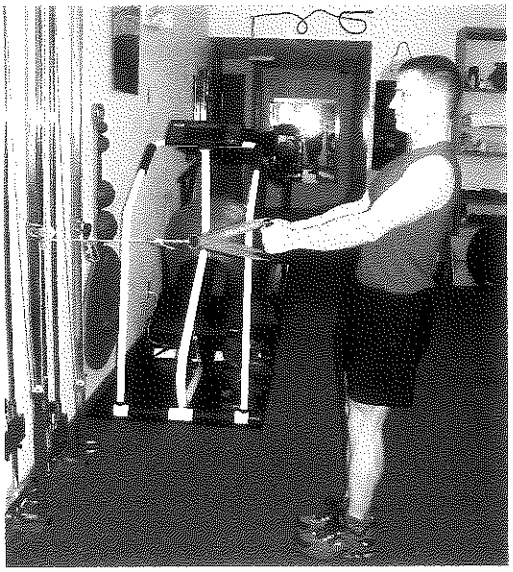


Figure 4.21 Standing cable rowing starting position

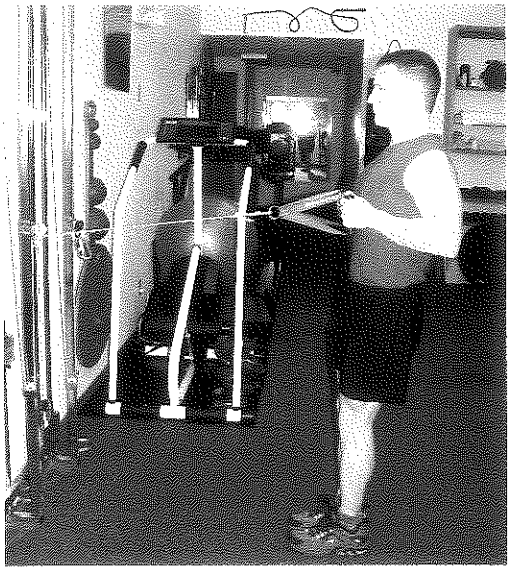


Figure 4.22 Standing cable rowing midpoint

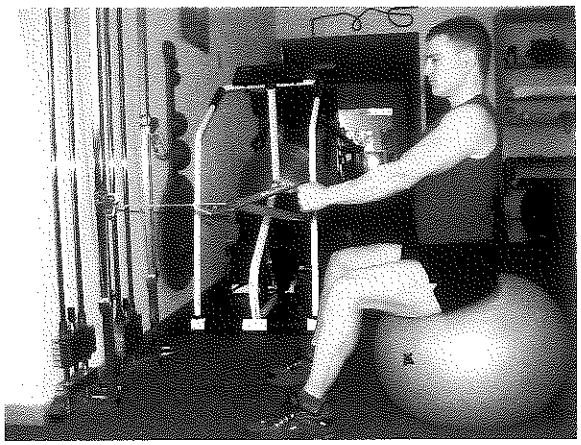


Figure 4.23 Seated ball cable rowing starting position

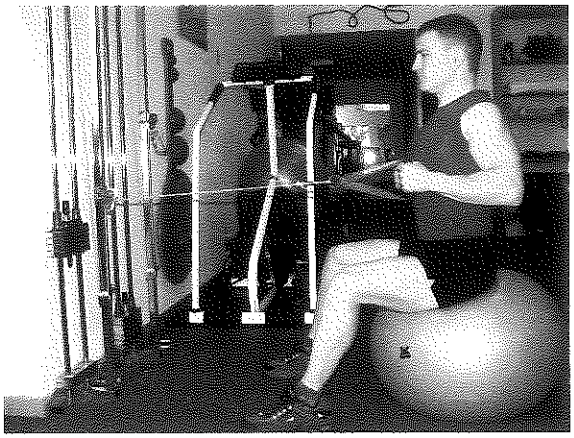


Figure 4.24 Seated ball cable rowing midpoint

Tip: Rowing can be done a variety of ways. You can use a band, cable system or even sit on an exercise ball. Pick the way that you like best or change it up for variety. *Rowing in some form should always be part of your exercise routine* as keeping these muscles strong will help keep you from rounding your shoulders!

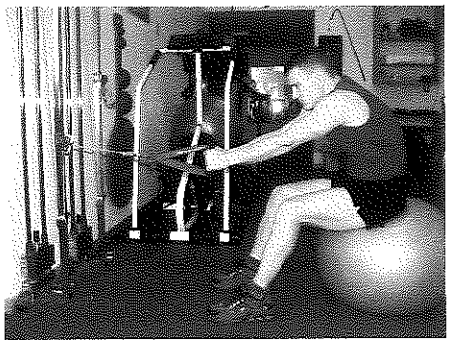


Figure 4.25 Tip for rowing: no rounding your back!

Tip (figure 4.25): Whichever way you choose to row, **do not let your back round**! Instead, keep your back straight at all times with an inward curve in your low back.

MACHINE ROWING w/ chest plate (horizontal fibers)—covered in book later
MEDIUM-GRIP LAT PULL-DOWNS (vertical fibers)

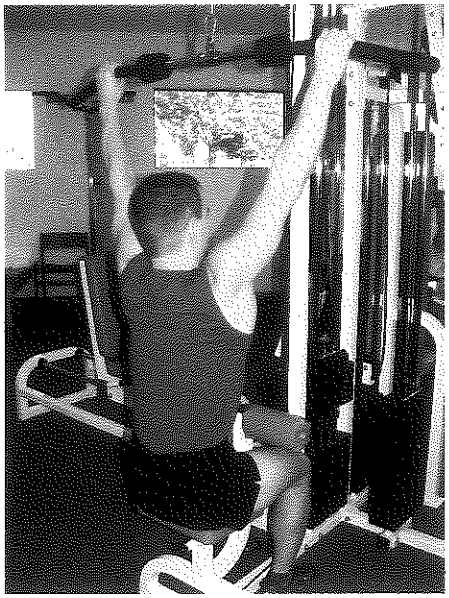


Figure 4.26 Medium-grip lat pull-downs starting position

Starting Position (figure 4.26): Sit on a lat pull-down machine (or use a band over a door as shown below) with the thigh pads just touching your thighs. Grip the bar overhead just barely wider than shoulder width—gripping wider than this places your shoulder muscles in an awkward position and can cause injury. Note: If this grip position hurts your shoulders, then grip even narrower as this modification will usually take away the pain.

Midpoint (figure 4.27): Exhale as you pull the bar down towards your collar-bone region. Pause for a moment and slowly return the bar to the starting position and then inhale. It is good to have a slight arch in your low back but do not overdo it.

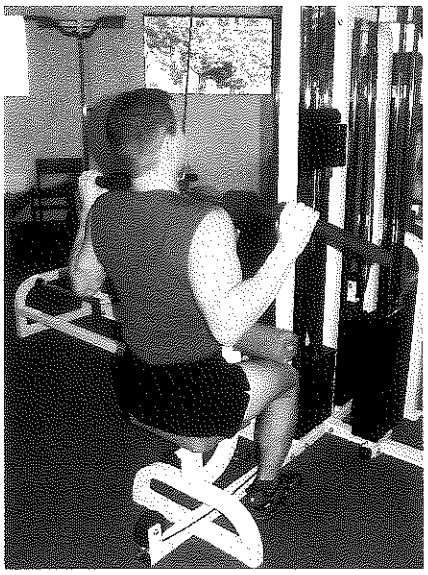


Figure 4.27 Medium-grip lat pull-downs midpoint

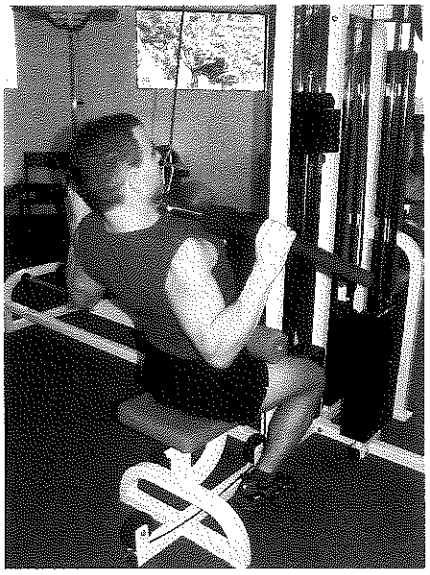


Figure 4.28 Tip for lat pull-downs—do not lean back too far!

Tip (figure 4.28): Do not over-arch your low back. Keeping your abdominals tight will help prevent this mistake. Avoid swinging or jerking at the top of the movement.

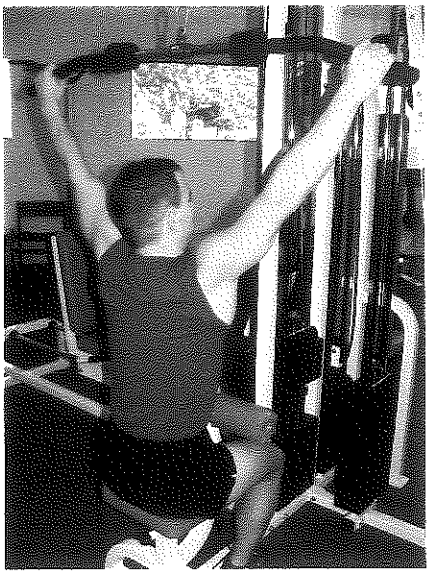


Figure 4.29 Tip for lat pull-downs—do not grip too wide

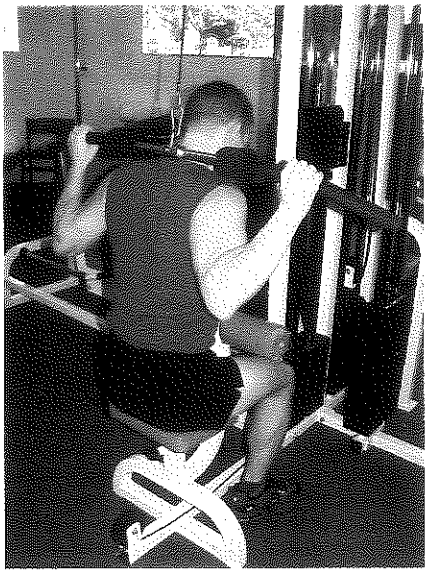


Figure 4.30 Tip for lat pull-downs—do not bring bar behind neck

Tip (figures 4.29 and 4.30): Do not grip the bar too wide and do not even think about pulling the bar behind your head/neck as it places both your neck and shoulders in a perfect position to get injured.[1] Specifically, the shoulders become unstable in this extreme position of external rotation and abduction.

NARROW-GRIP LAT PULL-DOWNS with V-bar: figures 4.31 and 4.32 (vertical fibers)

Same form as medium-grip pull-down except with a V-bar for variety. Keep your abdominal muscles tight and squeeze your shoulder blades together at the bottom of the movement. This is one of my favorite exercises for working the back and I often alternate between this and medium-grip lat pull-downs for variety.

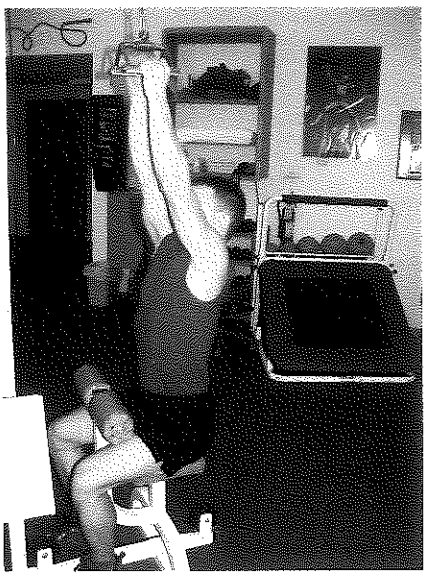


Figure 4.31 Narrow-grip lat pull-downs with V-bar starting position

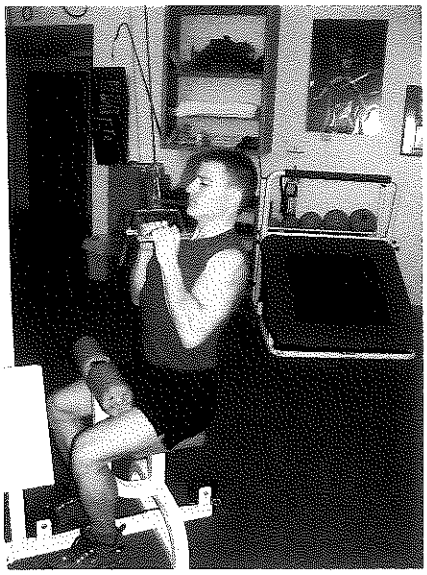


Figure 4.32 Narrow-grip lat pull-downs with V-bar midpoint

NARROW REVERSE-GRIP LAT PULL-DOWNS: figures 4.33 and 4.34 (vertical fibers)

Same form as medium-grip pull-downs, except your hand placement is backwards (palms facing your face) and narrower.

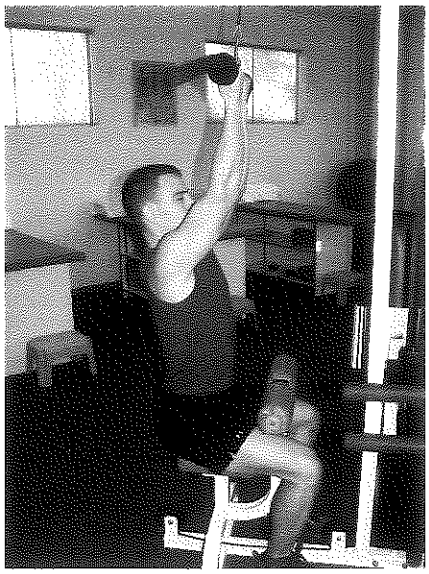


Figure 4.33 Narrow reverse-grip lat pull-downs starting position

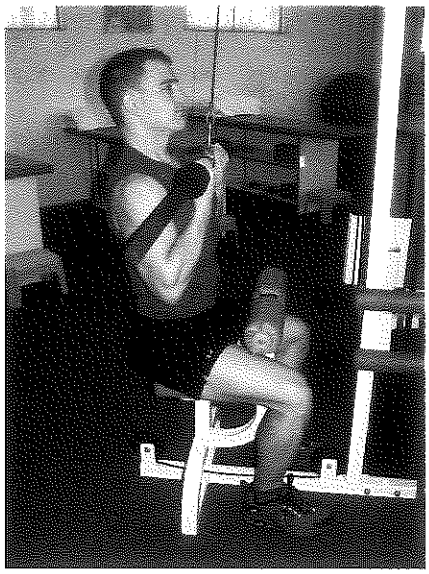


Figure 4.34 Narrow reverse-grip lat pull-downs midpoint

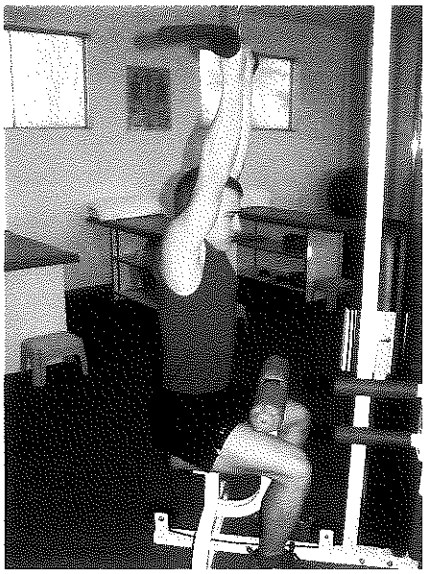


Figure 4.35 Tip for narrow reverse-grip lat pull-downs—no hanging or jerking at top

Tip (figure 4.35): Do not let your shoulders "hang" (as shown at left) to end-range at the top with your muscles completely relaxed as this can place excessive stress on your shoulders. It is good to stop just shy of the top with this exercise.

DUMBBELL PULL-OVERS (vertical fibers)

This is a good exercise to work the upper back but you must be careful that you do not force your shoulder to end-range when over-head as it can "impinge" or pinch the muscles of the rotator cuff and sub-acromial bursa against a bony shelf. Even if it does not hurt at the time it can inflame your shoulders and they will hurt the next day. However, if you stop short of end-range you will be fine. Just pay attention to your form as shown below. This exercise almost made the "yellow light" classification due to the potential for impingement but was included here since with strict form it is safe.

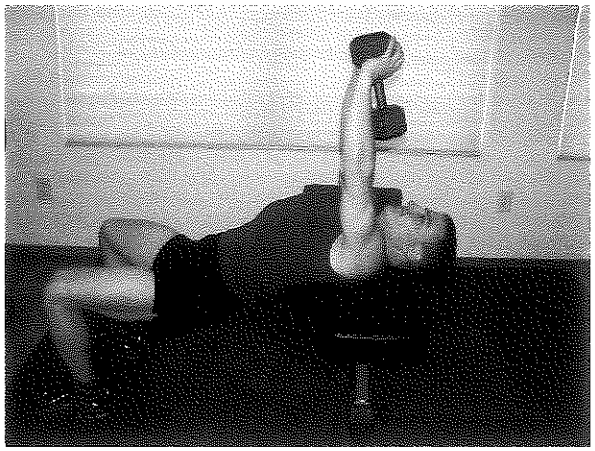


Figure 4.36 Dumbbell pull-overs starting position

Starting Position (figure 4.36): Lie on your back perpendicular to the bench press with your upper-back and neck supported. Hold a dumbbell over your shoulders with elbows straight.

Midpoint (figure 4.37): Slowly lower the weight while you exhale and expand your ribcage. It is OK to allow your elbows to bend slightly as you reach overhead. Be sure that you stop the movement before you flex your shoulders to end-range.

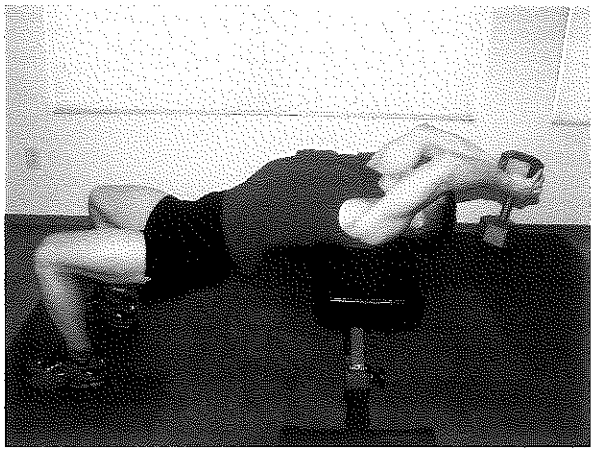


Figure 4.37 Dumbbell pull-overs midpoint

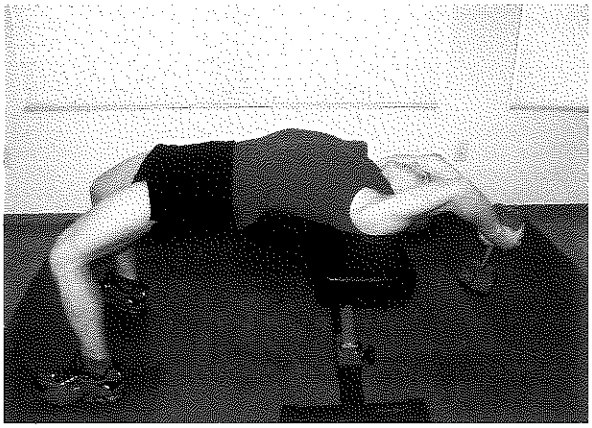


Figure 4.38 Tip for dumbbell pull-overs—do not over-arch your back or force shoulders to end-range.

Tip (figure 4.38): Avoid over-arching (hyper-extending) back and do not force shoulders to end-range unless you want sore shoulders later.

MEDIUM-GRIP PULL-UPS—in front of head only (vertical fibers)

Note: Only perform this exercise after many months or years of weight training when lat pull-downs have become easy with close to your bodyweight. I love pull-ups and think that they are one of the best exercises for the back but you have to work up to them. Pull-ups are green light exercises for intermediate to advanced lifters.

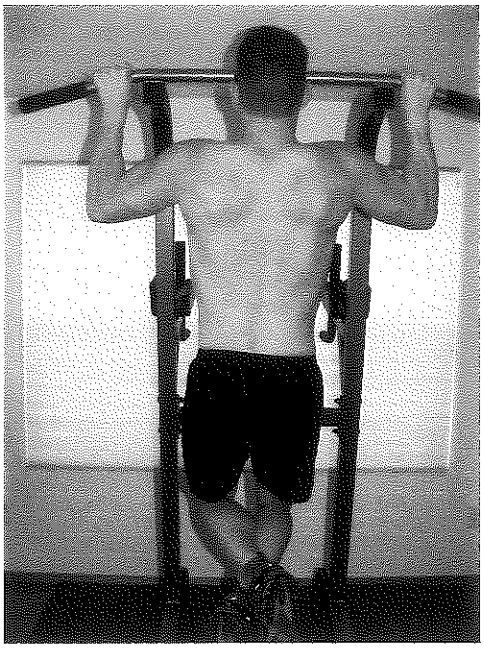


Figure 4.39 Medium-grip pull-ups starting position

Starting Position (figure 4.39): Start with your hands slightly wider than shoulder width apart with a box or stand underneath your feet. Use your legs to get to a position where your forehead region is near or touching the bar.

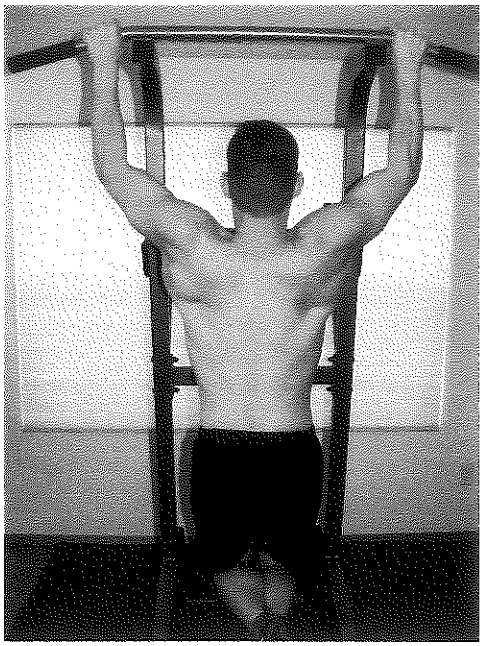


Figure 4.40 Medium-grip pull-up midpoint

Midpoint (figure 4.40): Slowly lower your body until your elbows are almost straight but still flexed/bent about ¼ of the way. (Do not hang at the bottom of the movement as it can injure your shoulders.) Now smoothly reverse directions and accelerate up towards the bar to the starting position.

Tip: This is one of the few exercises where I limit the range of motion a little at the top and bottom. If you "hang" at the bottom it can place excessive stretch on the shoulder musculature and cause a strain. Likewise, at the top of the motion only pull to roughly your forehead or the bridge of your nose to the bar. Every time that I hurt myself with pull-ups it was when I was trying to touch my chin to the bar. This action requires

excessive motion of the shoulders and cervical spine, thus placing your body in an awkward position perfect for injury.

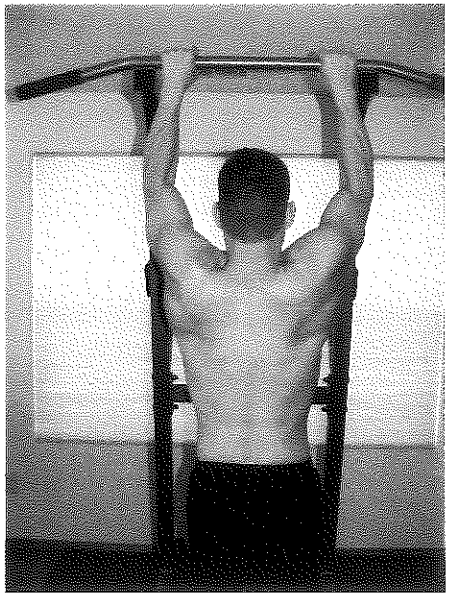


Figure 4.41 Tip: Pull-ups can also be performed with a narrow grip if this is more comfortable for your shoulders.

Tip (figure 4.41): Some clients that I have worked with find the narrow-grip position non-painful when the medium-grip position hurt their shoulders. Again, remember that any form of pull-up is for intermediate to advanced lifters. You need a good base of strength before attempting this exercise.

REVERSE NARROW-GRIP PULL-UPS (vertical fibers)**:**

For narrow-grip pull-ups follow the same form as for medium-grip pull-ups. The only real difference is that your palms are now facing towards your body. This will cause you to use your bicep muscles more (than a palm forward—pronated—grip) but the back is still working pretty hard too. This is simply another variation of the pull-up that is safe when performed correctly.

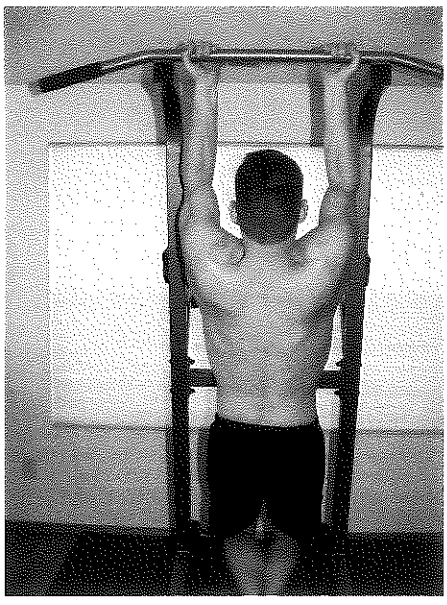


Figure 4.42 Reverse narrow-grip pull-ups starting position

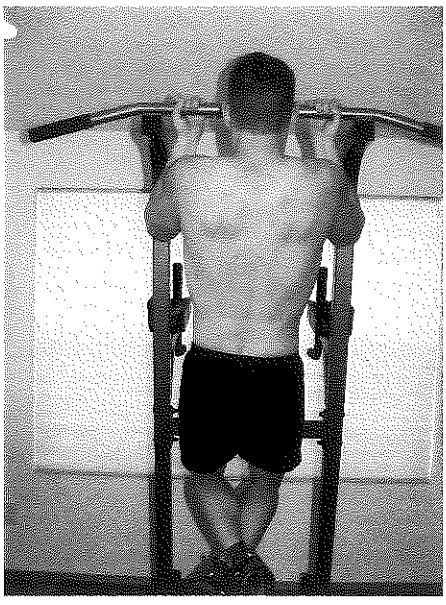


Figure 4.43 Reverse narrow-grip pull-up midpoint

SHOULDERS

Since the rotator cuff is the most commonly injured and vulnerable muscle group in the shoulder it seemed fitting that this section should start with the exercises needed to help build it. Although this is the "shoulder" section, realize that with many of the upper body exercises you use your shoulders as well such as when training back. However, the following exercises are traditionally considered shoulder exercises as they directly work the rotator cuff and deltoid muscles of the shoulder.

The rotator cuff also demands special attention since these muscles are commonly injured and/or torn while we are at play or work causing pain ranging from nagging to absolutely excruciating. When torn these muscles often require surgery and post-operative physical therapy. Even if the rotator cuff muscles are not torn, exercising improperly can give you a bad case of tendonitis or impingement which is painful as well. Spending only a few minutes each week to keep your rotator cuff strong is a wise investment! *Shoulder internal and external rotation is an exercise that you should never skip.*

The green light, yellow light, and red light categories in this book are designed to help you avoid these problems. With shoulder training it is very important to train with a weight that you can control, use proper form and progress slowly.

In addition to the rotator cuff helping to hold your shoulder together there is the overlying deltoid muscle that plays a role in shoulder function as well. The rotator cuff and deltoid work together to create a force couple about the joint. While the rotator cuff generally pulls down and in, the deltoid muscle pulls up and out—when coupled together they produce a "spin" or rotation in the shoulder joint to provide movement so that you can reach in the cupboard. The deltoid muscle can functionally be divided into three parts: front (anterior), side (lateral) and rear (posterior). The exercises are labeled so that you know which part of the deltoid that you are working with any given exercise.

Please note that the side (lateral) deltoid raises are covered in the yellow light chapter due to its tendency to cause shoulder impingement. Side raises can be done without injury but it is best to start with the exercises that are "foolproof" in a sense and then add in the less forgiving exercises later with proper form. Many times when someone comes to me in the clinic for a shoulder problem, and are already performing a weight training workout, when I temporarily omit side raises and overhead presses his or her pain often begins to resolve.

Exercises for the shoulder must be chosen with care so injury or impingement does not result. Impingement is when the head of the humerus (your upper arm bone) collides with the overlying acromion or coracoid process (see figure 4.44 below). When this happens, some of the rotator cuff muscles (i.e. supraspinatus) are "pinched" or impinged between the humerus and the acromion process. This can cause pain at the time or sometimes is felt the next day after the inflammatory process has kicked in.

Common Question—Should you walk or run with hand weights?: Since this is the shoulder section it seemed fitting to debunk this common practice. Please DO NOT walk or run with hand weights! Walking with hand (or ankle weights for that matter) weights is a great way to injure your shoulder. Walking with hand weights is extremely hard on the ligaments and rotator cuff muscles of your shoulder because you are placing a weight at the end of the long lever arm where extra weight was not designed to be for repetitive movement. This extra weight, "levers" or places extra stain on your shoulder connective tissues and can lead to injury. Your arms are already "weighted" and proportioned just right so do not change the physics that mother nature gave you. We are built the way we are for a reason. Many experts on walking also recommend against walking with hand weights.[1-3]

In short, if you want to increase the intensity of your workout, walk further or walk faster, but do not add hand weights. Save the weight training for your home or the gym, not the track. Do not try to change and aerobic exercise into a weight training exercise as this is almost always a recipe for a disaster.

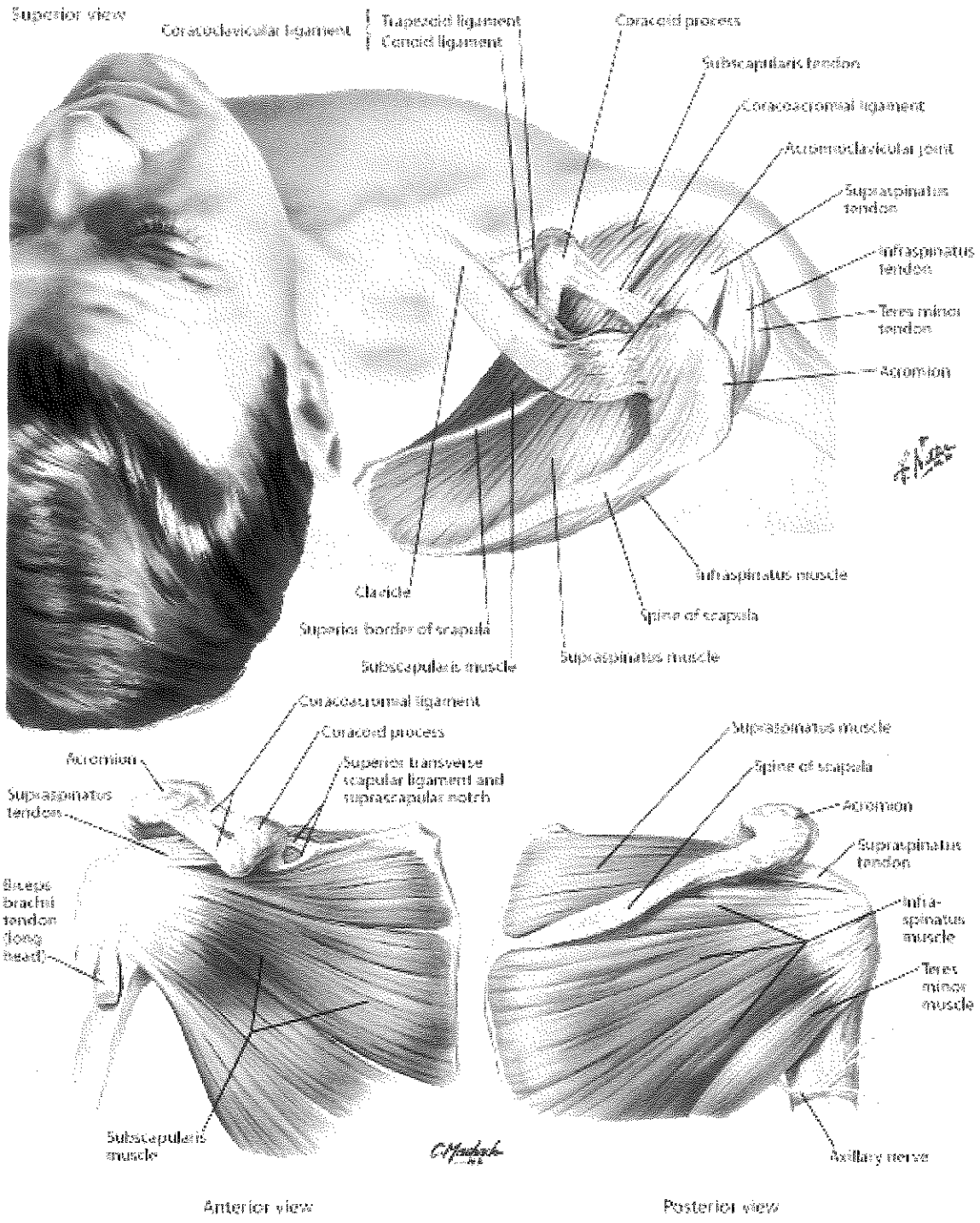


Figure 4.44 Figure of rotator cuff muscles. Notice how little room exists between the supraspinatus tendon and the bony acromion process—this close tolerance is one of the reasons why impingement can occur (bottom left). Reprinted with permission—Courtesy of Elsevier, Inc.

SHOULDER INTERNAL ROTATION (Rotator Cuff):

Internal rotation builds the subscapularis which is a rotator cuff muscle in the front of your shoulder under the deltoid muscle. Even though you can not see this muscle it is extremely important.

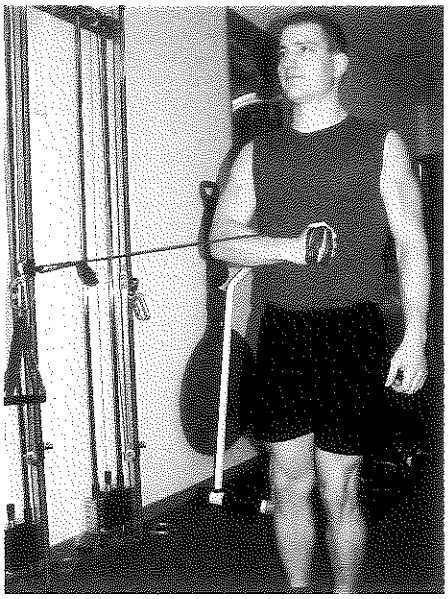


Figure 4.45 Shoulder internal rotation starting position

Starting Position (figure 4.45): Adjust the cable or band so that it is about waist height. Stand with your elbow at your side and bent to about 90 degrees. Your hand should be at the midline of your body.

Midpoint (figure 4.46): Keeping your elbow at your side and parallel to the floor rotate outward (away from your body) through an 80-90 degree arc of motion. Pause briefly, and exhale as you return to the starting position.

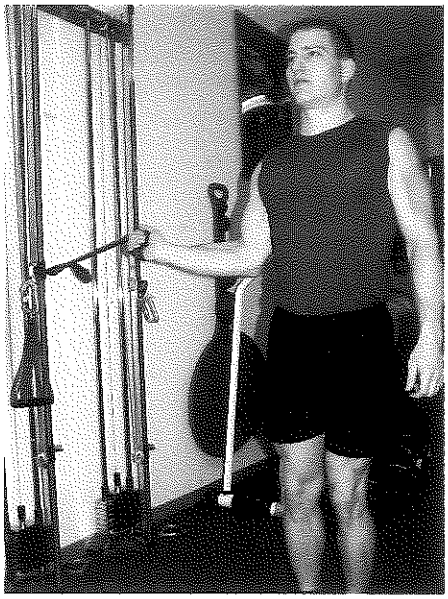


Figure 4.46 Shoulder internal rotation midpoint

Tip: Do not allow your elbow to pull away from your body or your elbow extend. Keep in mind that the only part of your upper body that should move is your hand and forearm. Keep the resistance light so you are not tempted to substitute with other muscle groups. The muscles that you are working are quite small so not much resistance will be needed. This one reason that I prefer a band for resistance over a cable or dumbbells. A cable with weights can be used but minimal resistance will be needed.

SHOULDER EXTERNAL ROTATION (Rotator Cuff):

The back part of the rotator cuff is mainly formed of the infraspinatus and teres minor muscles. These muscles are again located under the superficial deltoid muscle. To create a balance around the joint both directions (internal and external rotation) must be exercised as they work together to form a force couple around the shoulder joint.

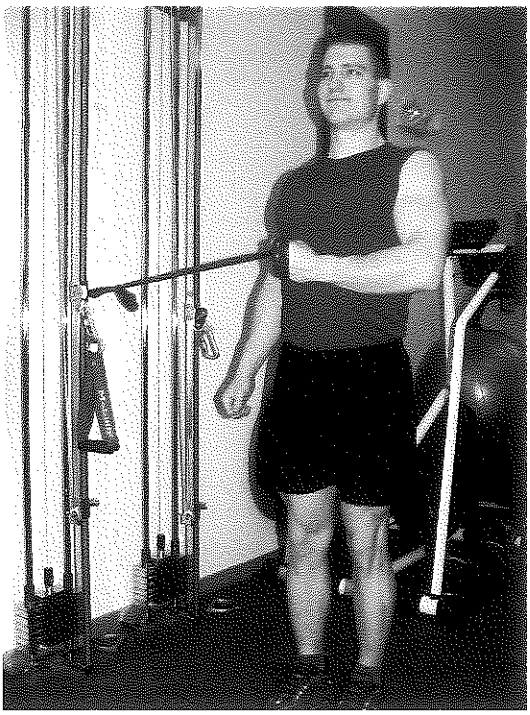


Figure 4.47 Shoulder external rotation starting position

Starting Position (figure 4.47): This is the same position as with external rotation, except the resistance is applied in the opposite direction. Adjust the cable or band so that it is about waist height. Stand with your elbow at your side and bent to about 90 degrees. Your hand should be at the midline of your body.

Midpoint (figure 4.48): Keeping your elbow at your side and parallel to the floor rotate outward (away from your body) through a 90 to 120 degree arc of motion. Pause briefly, and exhale as you return to the starting position.

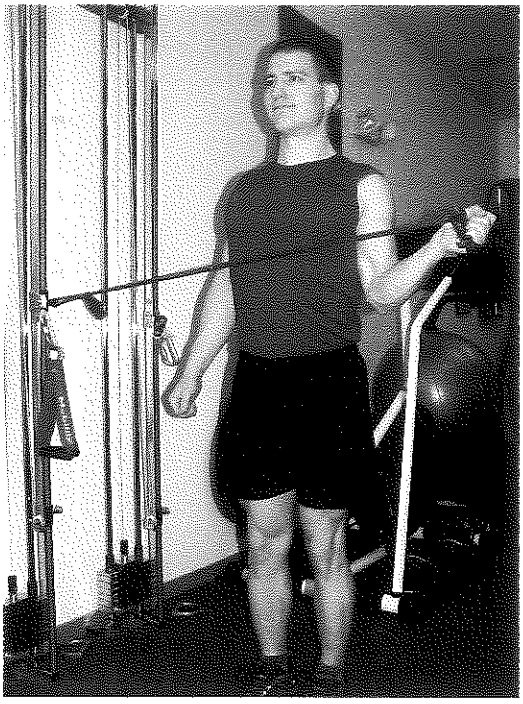


Figure 4.48 Shoulder external rotation midpoint

Tip: This exercise often confuses people. Internal and external rotation exercises are mirror images of each other. In both cases you are performing the same motion but what is different is the *direction that the resistance is applied.* Just make sure you exercise both shoulders in both directions and you will be OK. Be aware that *the external rotators are much weaker than the internal rotators, so with external rotation you will not use as much resistance.*

DUMBBELL FRONT RAISES (front/anterior deltoid):

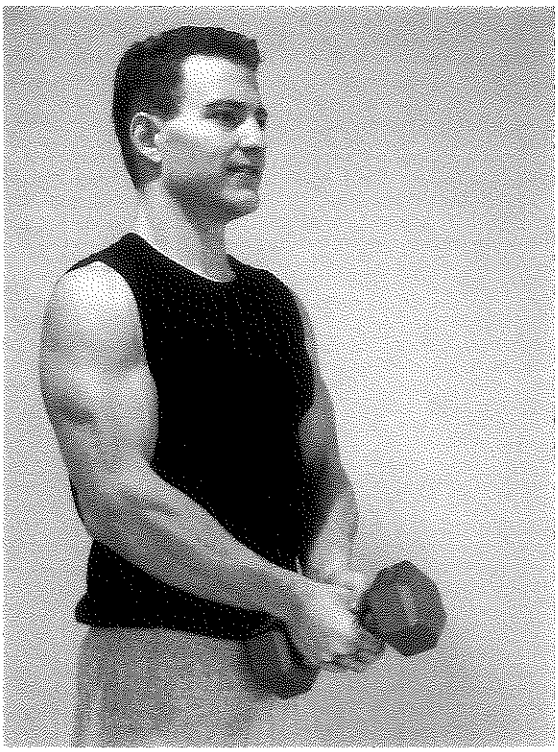


Figure 4.49 Dumbbell front raises starting position

Starting Position (figure 4.49): Stand with your feet about shoulder width holding dumbbell as shown with fingers and thumbs interlaced and with elbows slightly bent.

Midpoint (figure 4.50): Lift the dumbbell straight forward until it eye level or just below. Do not let the dumbbell move higher than eye level. Your elbow should NEVER be higher than your shoulders (not greater than 90 degrees of flexion). If they do it will put you at risk for an irritation of the shoulder tendons (impingement). Notice how my elbows are below shoulder level and my shoulders are about at 80 degrees of flexion.

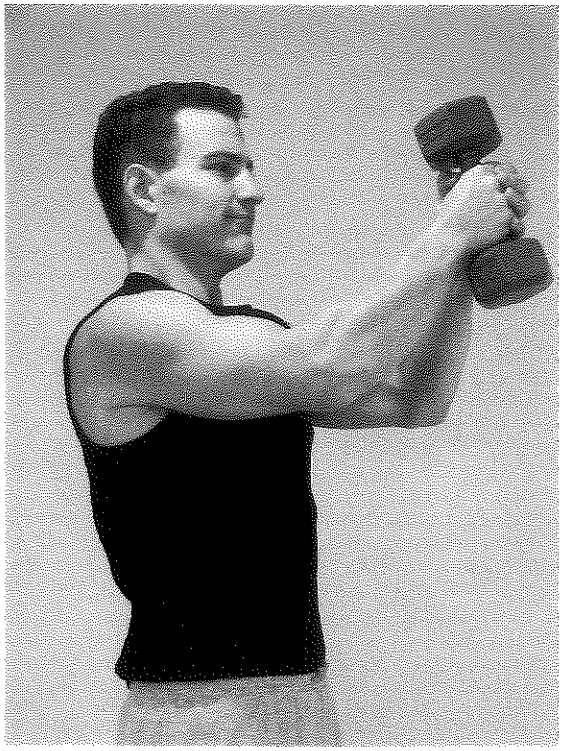


Figure 4.50 Dumbbell front raises midpoint

Tip: This can be performed one arm at a time by using lighter dumbbells and alternating. If you use one dumbbell at a time be sure and KEEP YOUR THUMBS UP as this keeps the greater tuberosity of your humerus from pinching your shoulder tendons (impingement) as you approach 90 degrees of flexion.

Tip: You can use a band for resistance as well and perform it one side at a time. Again, keep your thumb up towards the ceiling when performing this movement and do not let your elbows move higher than your shoulders. We do not want any painful shoulders around here!

DUMBBELL SIDE RAISES—in scaption (Rotator Cuff & Deltoid)

Until recently, strengthening the supraspinatus muscle (another muscle of the rotator cuff) was strengthened by performing this exercise with thumbs down or in what could be called the "empty can" position as electromyography (EMG) studies showed supraspinatus activity to be very high in this position. However, this was only half the story because although EMG activity was high in the muscle, the shoulder joint became impinged as this empty can position rotated the greater tuberosity of the humerus under the sub-acromial and also downward tips the scapular shelf thus causing impingement. Now it is recommended that this exercise be performed in the thumbs up position to place the shoulder in a mechanically superior plane to work out of and therefore avoid impingement.[5-6]

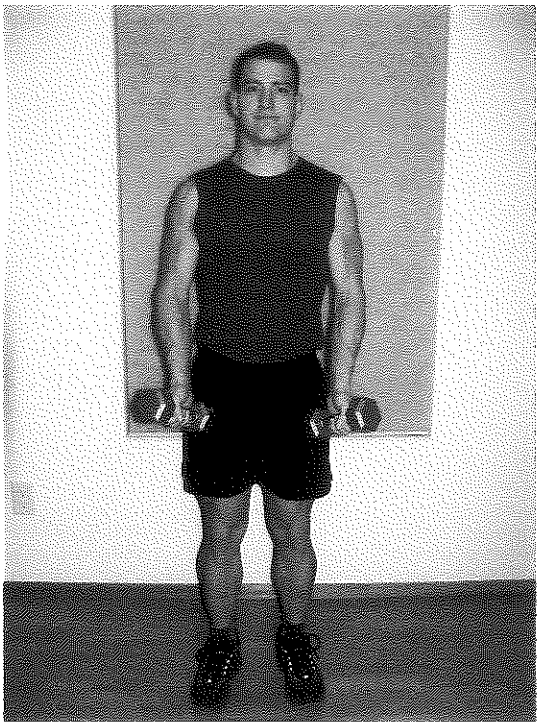


Figure 4.51 Dumbbell side raises in scaption starting position

Starting Position (figure 4.51): Start holding two dumbbells with thumbs pointing up towards the ceiling and slightly rotated outwards. The supraspinatus muscle is not very strong so please use light weight and strict form.

Midpoint (figure 4.52): Raise the dumbbells keeping thumbs up in a diagonal plane (in scaption—30 degrees from the horizontal)—not straight in front of you and not straight out to the side—instead somewhere in between. Pause a moment at the top and then return to the starting position.

Tip: Never perform this exercise thumbs down in the "empty can" position unless you want a sore set of shoulders.

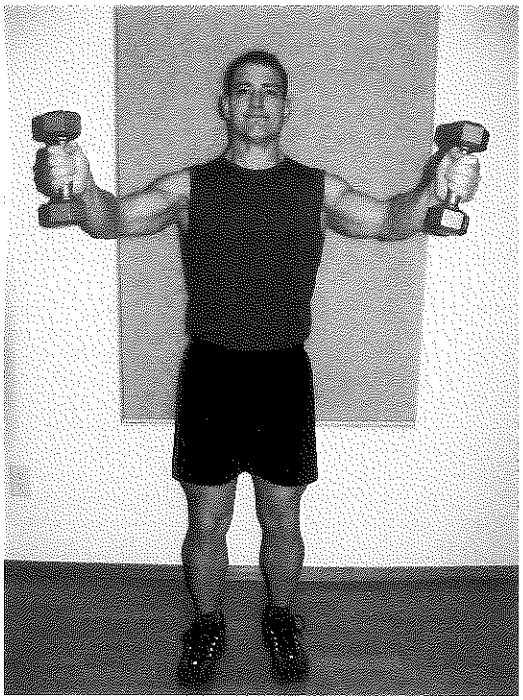


Figure 4.52 Dumbbell side raises in scaption midpoint

DUMBBELL REAR RAISES (rear/posterior deltoid):

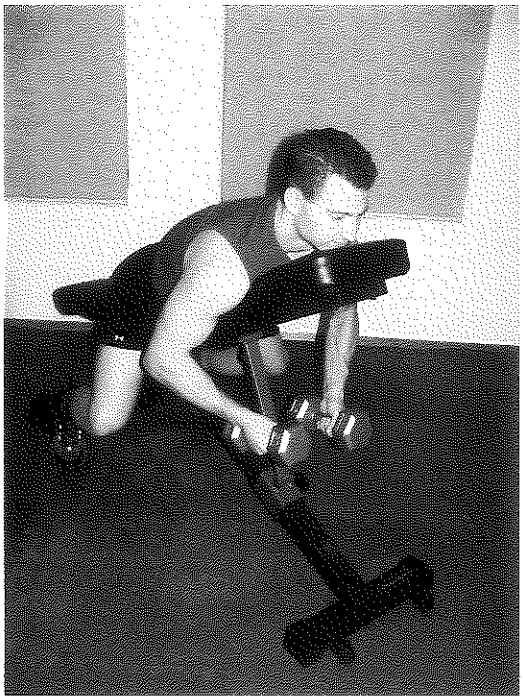


Figure 4.53 Dumbbell rear raises starting position

Starting Position (figure 4.53): Lie on your stomach with an incline bench set at 30-40 degrees with a dumbbell in each hand as shown. Notice that the elbows are about 45-50 degrees away from the body. This is to protect the shoulders. Remember, the further your elbows move away from your sides the more pressure there is on your shoulders. See tip below for a different angle of the starting position.

Midpoint (figure 4.54): Squeeze your shoulder blades together while keeping your elbows bent. Stop the movement when your elbows are about even with your shoulders or arms are parallel to the floor. This helps prevent overstretching the front of the shoulder and rotator cuff.

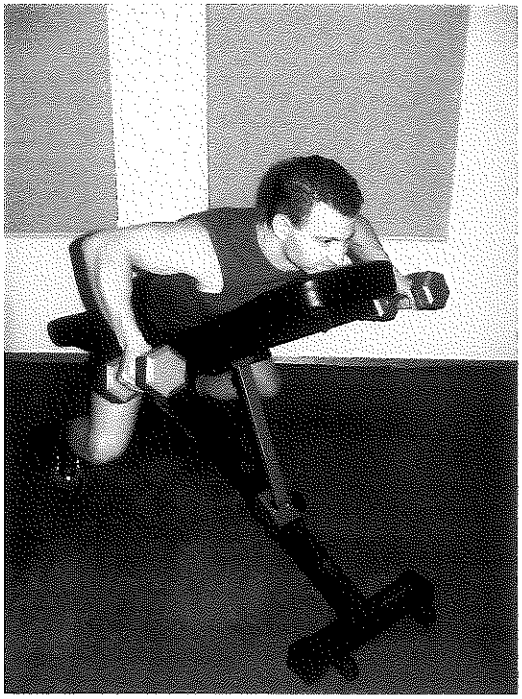


Figure 4.54 Dumbbell rear raises midpoint

Note: For important tips on dumbbell rear raises see next page.

DUMBBELL REAR RAISES CONTINUED... (rear/posterior deltoid):

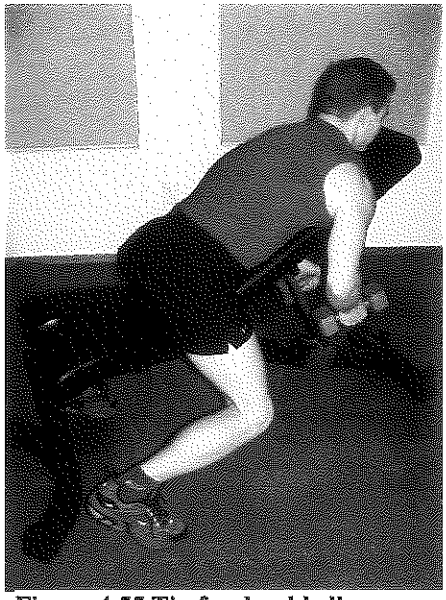


Figure 4.55 Tip for dumbbell rear raises

Tip (figure 4.55): Note the correct placement of the elbows not too far away from the body in the start position.

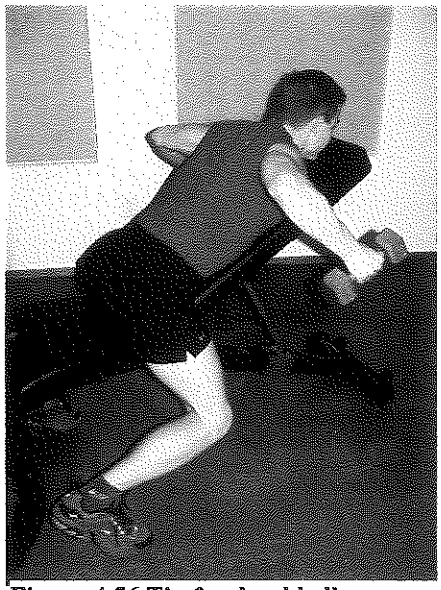


Figure 4.56 Tip for dumbbell rear raises

Tip (figure 4.56): Here is another angle of the "midpoint" position to show proper elbow placement with elbows below shoulder level.

BICEPS (see figures 2.4 and 4.1 for relevant anatomy)

ALTERNATE DUMBBELL CURLS (Biceps):

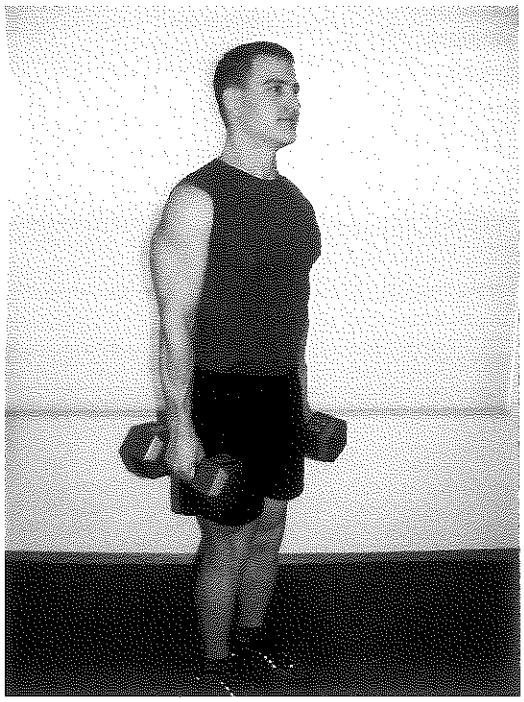


Figure 4.57 Alternate dumbbell curls starting position

Starting Position (figure 4.57): Stand with your feet about shoulder width apart with your palms towards your hips/thighs. (You can also perform this exercise seated on the end of a bench if you prefer—I pick the standing position as this reduces the pressure on your spinal discs.) Keep your abdominals tight with a slight inward curve (lordosis) in your lower back.

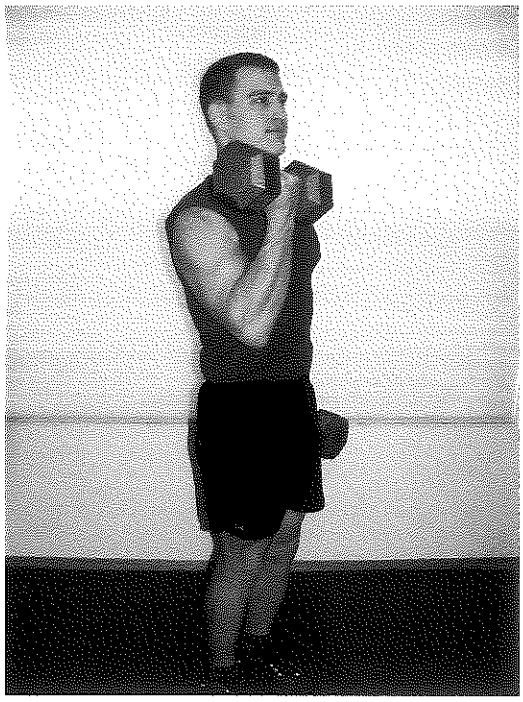


Figure 4.58 Alternate dumbbell curls midpoint

Midpoint (figure 4.58): Exhale while you bend your elbow and slowly turn your palm up. Keep your biceps tight through the entire movement—even at the top. Slowly lower back to the starting position and inhale.

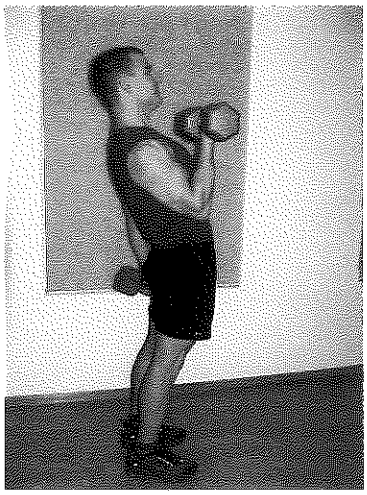


Figure 4.59 Tip for altenate dumbbell curls—do not over-arch backwards!

Tip (figure 4.59): No not arch backwards while you curl or use momentum to get the dumbbells moving. Pick a weight that allows you to use good form without cheating. This exercise could also be performed using a band if needed.

HAMMER CURLS (Biceps and forearms):

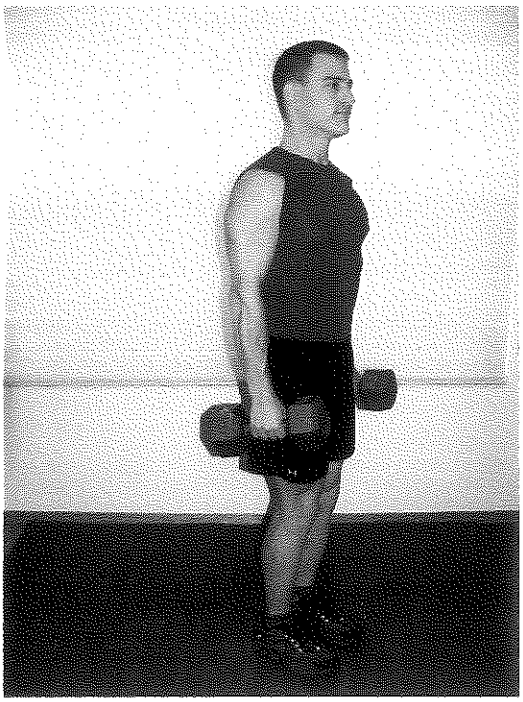


Figure 4.60 Hammer curls starting position

Starting Position (figure 4.60): Stand with your feet about shoulder width apart with your palms towards your hips/thighs. Keep your abdominals tight with a slight inward curve (lordosis) in your lower back.

Midpoint (figure 4.61): Exhale while you bend your elbow. Maintain the same hand/forearm position throughout the entire movement. Slowly lower back to the starting position and inhale.

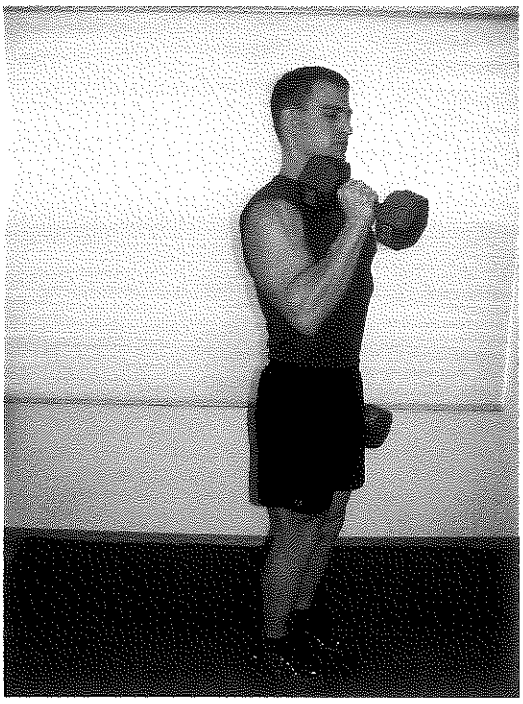


Figure 4.61 Hammer curls midpoint

Tip: Occasionally some people find that the twisting motion of alternate dumbbell curls can make their elbows sore. When this occurs I substitute hammer curls for alternate dumbbell curls and this usually eliminates the elbow pain.

CONCENTRATION CURLS (BICEPS)

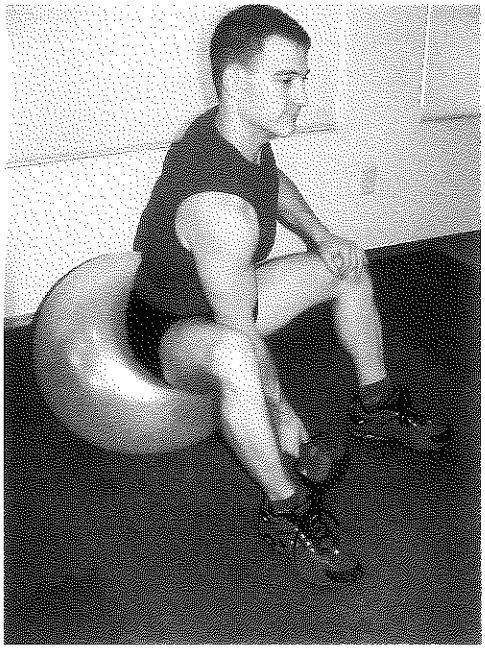


Figure 4.62 Concentration curls starting position

Starting Position (figure 4.62): You can sit on a bench press or ball to perform this exercise. I prefer a ball as it enables me to roll down the ball and sit a little lower, thus keeping my back straighter than if I were seated higher on a bench press. *Keep your back straight* and rest the back of your elbow on your inner thigh.

Midpoint (figure 4.63): Slowly lift the dumbbell towards your opposite side ear, pause, and smoothly return the weight to the starting position. Keep your abdominals tight the whole time.

Note: If your back is sore you are better off performing a different exercise for your biceps as this exercise does put some pressure on your low back.

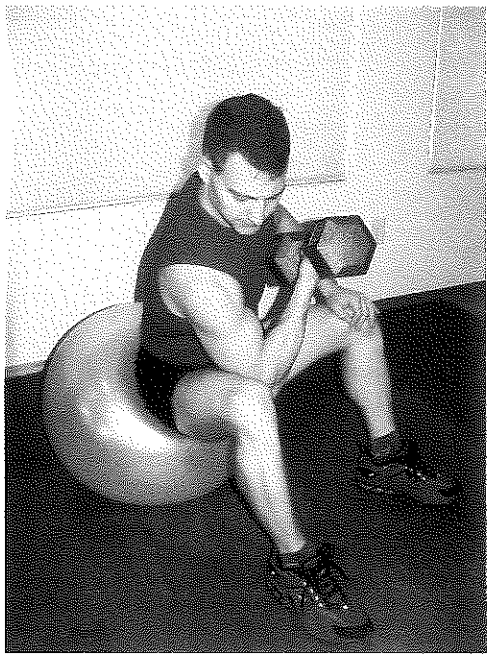


Figure 4.63 Concentration curls midpoint

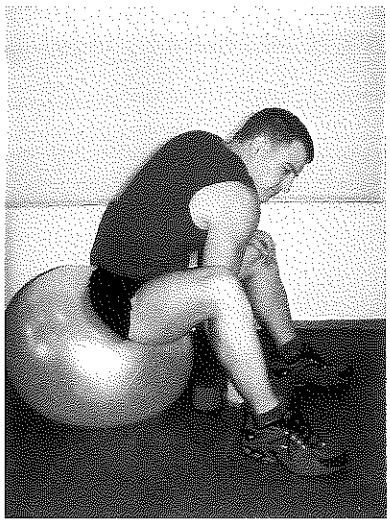


Figure 4.64 Tip for concentration curls

Tip: *DO NOT allow your back to round* and flex forward. You may get away with it once or twice but eventually you will pay some tuition with a sore back!

PREACHER BENCH CURLS with Cable (BICEPS):

This is hands down my favorite bicep exercise. This exercise does a nice job of isolating the biceps without placing your body in an awkward position. I was unable to get my biceps to grow very much (weak body part for me—we all have them) until I started performing this exercise. Hopefully, it will work for you as well!

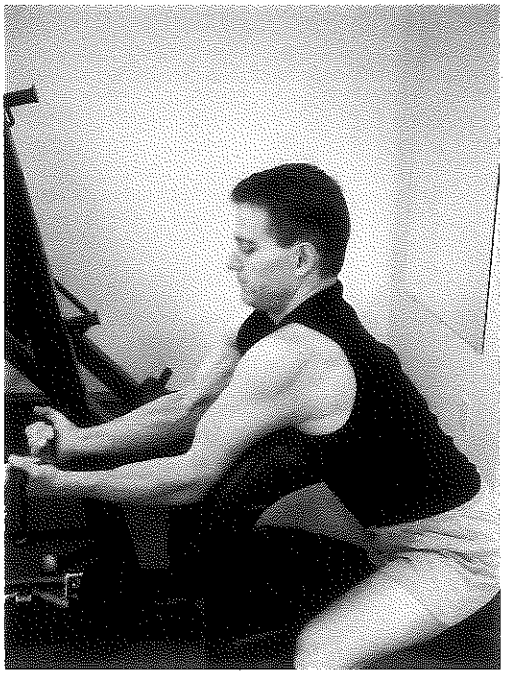


Figure 4.65 Preacher bench curls with cable starting position

Starting Position (figure 4.65): Sit on a bench with preacher bench attachment as shown. Adjust the height of the bench so that your arms are supported and your back is straight or ideally a slight inward curve. Start with your elbows in a slightly bent position as this will absorb pressure off your elbows. Use a bent curl bar attachment as this too with take some pressure off your elbows as opposed to using a straight bar.

Midpoint (figure 4.66): Lift with bar in a controlled manner while you squeeze your biceps with conscious effort. Pause at the top and then slowly lower.

Note: The nice part about a cable set up is that there is no resting at the top like with dumbbells! It really makes your biceps work hard. You will love to feel the pump.

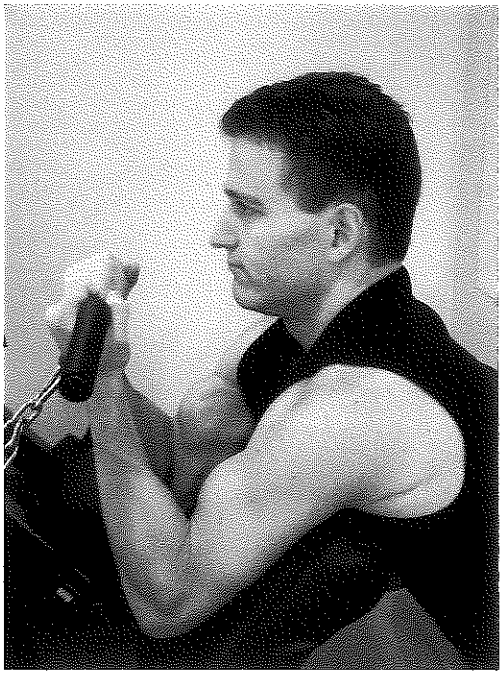


Figure 4.66 Preacher bench curls with cable midpoint

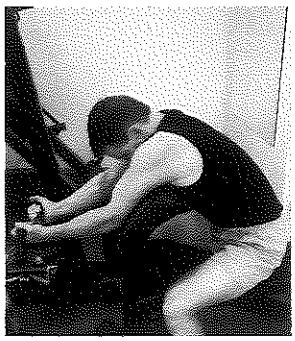


Figure 4.67 Tip for preacher bench curls—do not round back!

Tip (figure 4.67): Do not let your back round as this is a great way to strain your low back. Let your biceps do the work, not your back. If you find you are substituting like this it is a sure sign that you are lifting too heavy—lower the weight and straighten out your form.

BARBBELL CURLS (BICEPS)—see yellow light chapter

TRICEPS

It is best to train the triceps in a position where the elbows are as close to the sides as possible to minimize risk of injury to the shoulder. There is no need to point your elbow over your head, placing your shoulder in an awkward position at best. The triceps main job is to straighten the elbow so it is a relatively simple muscle to exercise. The key is to build your triceps while protecting the precious yet vulnerable rotator cuff of your shoulder. When training triceps it is also important to not bend your elbows past 90-100 degrees as going deeper than this will make your elbow joints sore—the wrong kind of pain. It is fine to extend your elbows straight but avoid "slamming" or snapping your elbows into hyperextension because this will make your elbows sore. If you find that it hurts to bring your elbows to full extension stop just short to eliminate the pain.

STANDING TRICEP CABLE EXTENSIONS (TRICEPS)

Although I try and place exercises that you can perform at home with dumbbells first in the chapter I had to break protocol here and place what is in my opinion, the safest and most effective tricep building exercise first. This exercise places the shoulders in an extremely safe and stable position because the elbows are at the sides of your body. Because the elbows are at your sides, the triceps are in a great position to be isolated and you will feel them work! Safe, yet effective—a perfect exercise for the triceps.

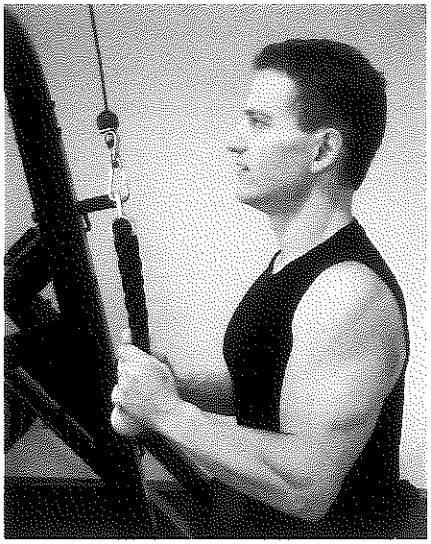


Figure 4.68 Standing tricep cable extensions starting position

Starting Position (figure 4.68): Stand with your back straight and abdominals tight holding onto a rope (or bar of your choice—see below). Your elbows should be against your sides and bent at about 90 degrees. If you bend your elbows much more than 90 degrees you will certainly earn yourself a sore pair of elbows. Ouch!

Midpoint (figure 4.69): Exhale as you squeeze your triceps and straighten your elbows. Pause and then return to the starting position. It is OK to straighten your elbows but do not "snap" them straight or try and hyperextend them. You elbows can go straight or almost straight if you prefer. Just squeeze your triceps at the end of the movement.

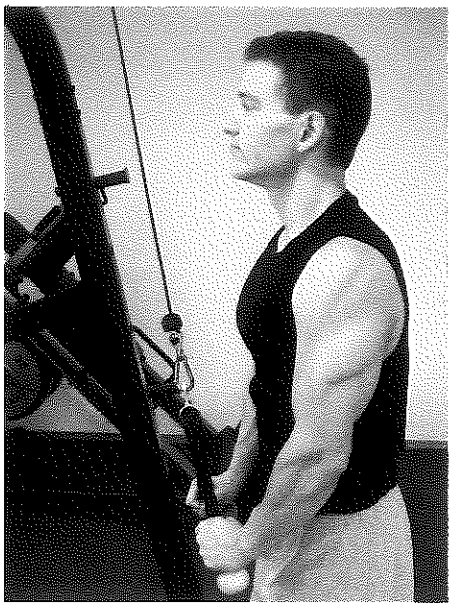


Figure 4.69 Standing tricep extensions midpoint

Tip: You can add variation to this exercise by changing your grip. You can use a rope, curved curl bar or tricep press bar. If your wrists hurt use a bar instead of a rope.

Tip: Be careful not to round your back forward and "hunch" as you do this exercise.

DUMBBELL "KICKBACKS" (TRICEPS)

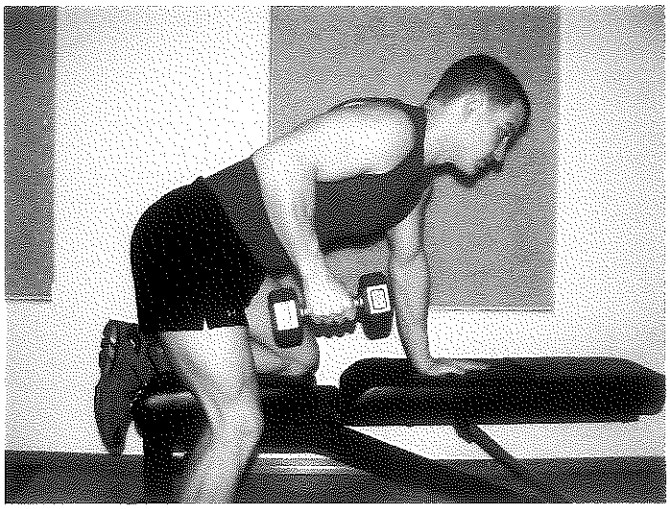


Figure 4.70 Dumbbell "kickbacks" starting position

Starting Position (figure 4.70): Half-kneel on bench with other foot on floor as shown with knee partially bent. Keep spine straight, elbow at side and arm parallel to body. Your elbow, with the weight, should be bent at about a 90 degree angle. Keep neck straight and do not round it towards floor. ALWAYS support your upper body on bench with opposite arm as this is what takes the pressure off your low back.

Midpoint (figure 4.71): Exhale as you extend your elbow and squeeze your triceps. Again, be sure and keep your arm fix at your side and move only your forearm by pivoting at the elbow. Return to the starting position.

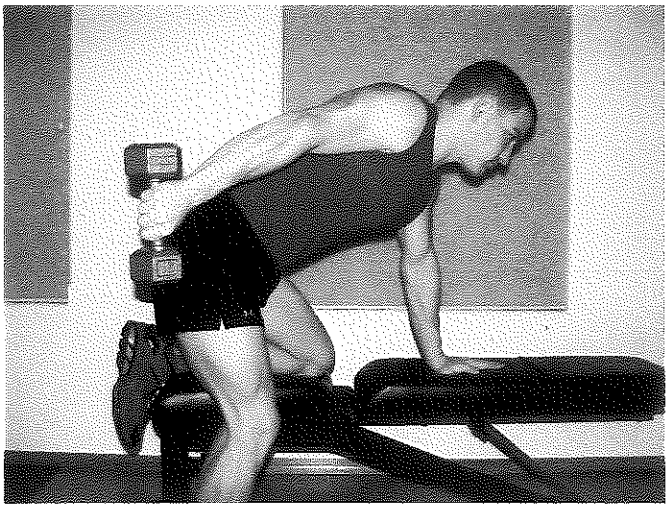


Figure 4.71 Dumbbell "kickbacks" midpoint

Tip: Do not hunch over or rock your body side to side while performing this exercise.

SUPINE DUMBBELL EXTENSIONS (TRICEPS):

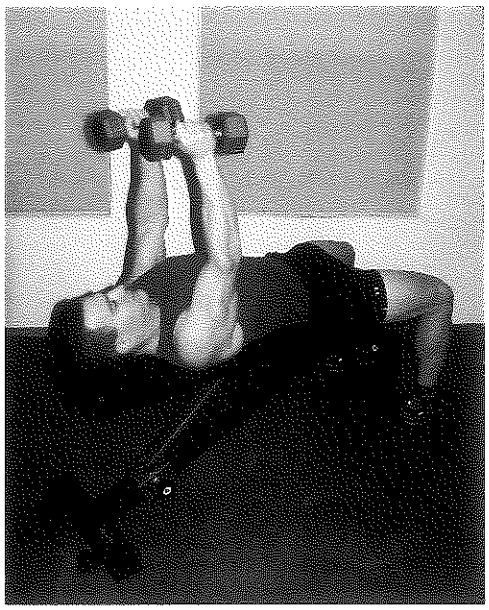


Figure 4.72 Supine dumbbell extensions starting position

Starting Position (figure 4.72): Lye on your back with a dumbbell in each hand held over your shoulder and feet firmly planted on the floor. Your thumbs should be pointed up or towards your head. Keep abdominals tight.

Midpoint (figure 4.73): Slowly bend your elbows, while exhaling, as you lower the weights towards the outsides of your head until your elbows are bent at about a 90 degree angle. Pause, and then exhale as you return to the starting position. Focus on squeezing those triceps as you straighten your elbows!

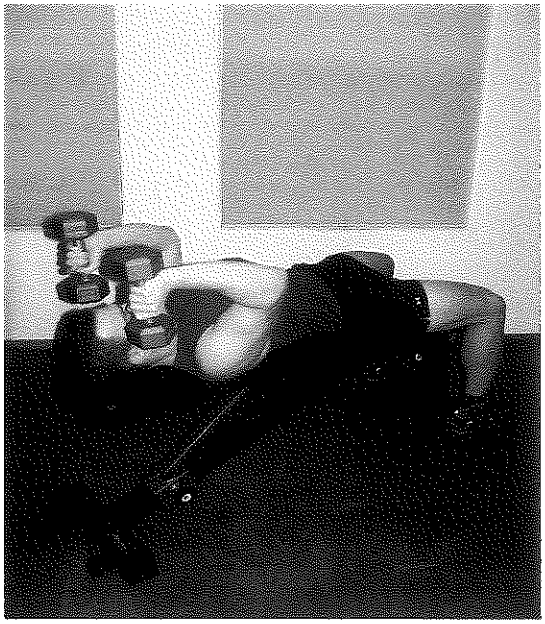


Figure 4.73 Supine dumbbell extensions midpoint

Figure 4.74 Tip for supine dumbbell extensions—do not bend elbows past 90 degrees!

Tip (figure 4.74): Do not bend your elbows past 90 degrees or it will make your elbows painful due to too much joint compression.

Note: For variety this exercise can be done with one dumbbell—see next page.

SUPINE DUMBBELL EXTENSIONS—one dumbbell method—(TRICEPS)

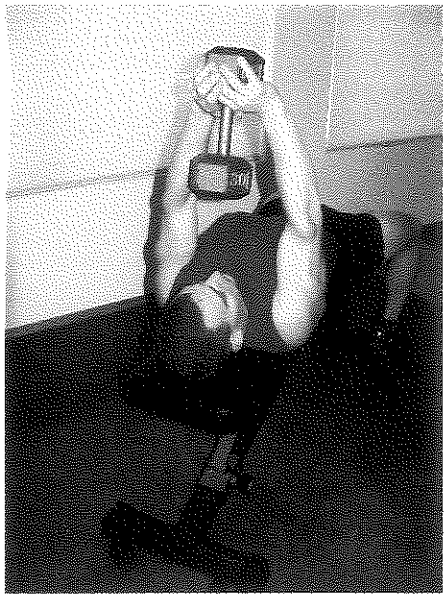


Figure 4.75 Supine dumbbell extensions—one dumbbell method starting position

Starting Position (figure 4.75): Grasp a dumbbell by interlocking your thumbs and index fingers. The dumbbell should be held in a midline position at about shoulder level.

Midpoint (figure 4.76): Inhale as you slowly lower the dumbbell to a position that is slightly overhead—be careful not to knock yourself cold as this may end your workout early. Stop lowering when your elbows are bent at about 90 degrees and return to the starting position as you exhale.

Figure 4.76 Supine dumbbell extensions—one dumbbell method midpoint

Tip: At first some of these exercises may seem awkward but with practice your nervous system will learn the movement patters and they will be second nature.

SUPINE FRENCH CURLS--aka "skull crushers"--with curl bar (TRICEPS):

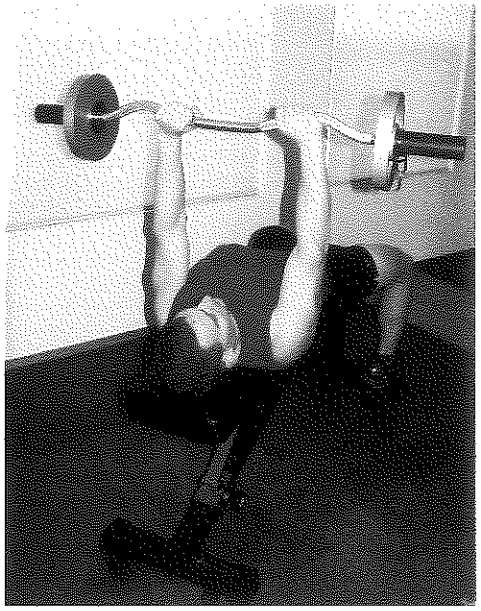


Figure 4.77 Supine French curls starting position

Starting Position (figure 4.77): Lye on a flat bench with feet flat on the floor grasping a curl bar as shown with about a shoulder width grip and elbows straight. The bar should be resting above shoulder level or slightly lower in a balance position.

Note: If you triceps get too tired stop because the bar can come down and "crush" your skull. You don't need to find out why these are called skull crushers. Trust me, it can happen.

Midpoint (figure 4.78): Slowly move the bar towards your forehead until your elbows are bent at about a 90 degree angle as you inhale. Exhale as you squeeze your triceps and return to the starting position. Try to keep you arms fixed in position with your elbows pointing up towards the ceiling--move only at the elbows.

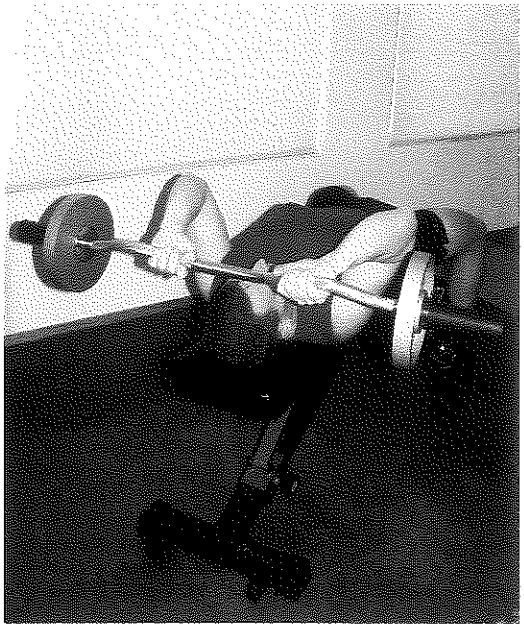


Figure 4.78 Supine French curls midpoint

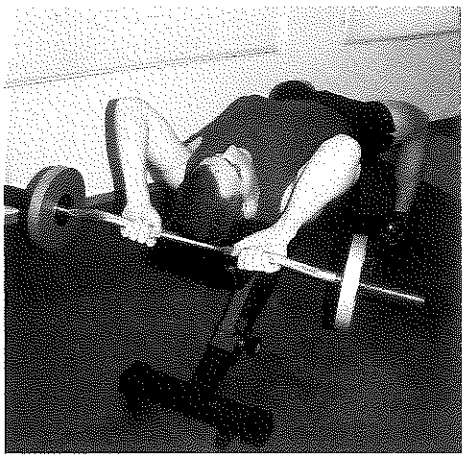


Figure 4.79 Tip for supine French curls—do not bend your elbows to an extreme position greater than 90 degrees as it will make them sore.

Tip (figure 4.79): Do not bend your elbows greater than 90 degrees or allow your elbows to drift overhead. Imagine that your arms are "frozen" and that you are only pivoting at the elbows.

THIGHS (QUADRICEPS)

The key to safe thigh training is to not ruin your back or knees in the process. Some thigh exercises place stress on the muscles by loading the spine with horrible compressive forces. This is to be avoided at all costs as many of us later in life will have some form of degenerative disk disease just from the natural aging process. We do not need to speed up this process by imprudent weight training. Still other thigh exercises do not compress the spine but place excessive compressive forces on the patella or shear forces on the knee.

However, it is possible to select safe exercises for the thighs by applying some guidelines based on pure physics:

- Do not pick exercises that compress the spine by placing excessive weight on the shoulders.
- Do not pick exercises which place extreme shear forces on the knee and when performing knee exercises do not allow your knee to move beyond your toes (more on this later in the actual exercise section).
- Another knee protection principle is to not allow your knees to bend/flex greater than 90 degrees while it is loaded during weight training. (The more you flex your knee the greater the pressure on the back of your patella or knee cap. This pressure is called patello-femoral joint reaction forces. Simply put, the more you bend your knee the greater the pressure on the back of your patella. Over time extreme pressure on the back of the patella will wear the smooth cartilage off leaving you with a painful knee.) Knee replacements are getting better all the time and today's surgeons are highly skilled but you might as well keep you original equipment when possible for as long as you can!

It is OK if you do not want to try and sort all this out for yourself. This is why I wrote this book. I got tired of seeing people injure their backs and knees because they innocently were performing the wrong exercises in the first place. Read on and I will show you how to exercise safely without accelerating the wear and tear on your joints. My goal is to keep you feeling good and exercising for years to come. Weight training, when done properly, is a sure ticket to a stronger you all throughout life and especially in your later years.

None of us relish the thought of someone taking care of us when we are older because we have lost our independence. Some things happen to us in life that are beyond our control, no doubt, even when we do everything right. However, thigh strengthening is one sure fire thing that you can do to decrease your risk of losing your independence in your later years! You do have some control so exercise it—literally.

Time spent on keeping your thigh muscles strong is time well spent indeed! These are the powerhouses that move you around each day. Lose these and you lose your mobility and freedom. The thigh muscles are responsible for getting you out of a chair, out of your car, carry you up and down the stairs and, yes, they even get you on and off the toilet. *Maintaining your quad strength is one of the best things that you can do to keep your independence throughout life.* If you decide you don't have time to perform some of the upper body exercises in this book at least pick one or two thigh exercises and perform them routinely. I guarantee if you do that it will pay you dividends later in terms of mobility.

The quadriceps extend, or straighten the knee, and are called "quads" for short. This is because the "quad" refers to the four muscles that comprise this muscle group, specifically, the Vastus Lateralis, Rectus Femoris, Vastus Intermedius and Vastus Medialis.

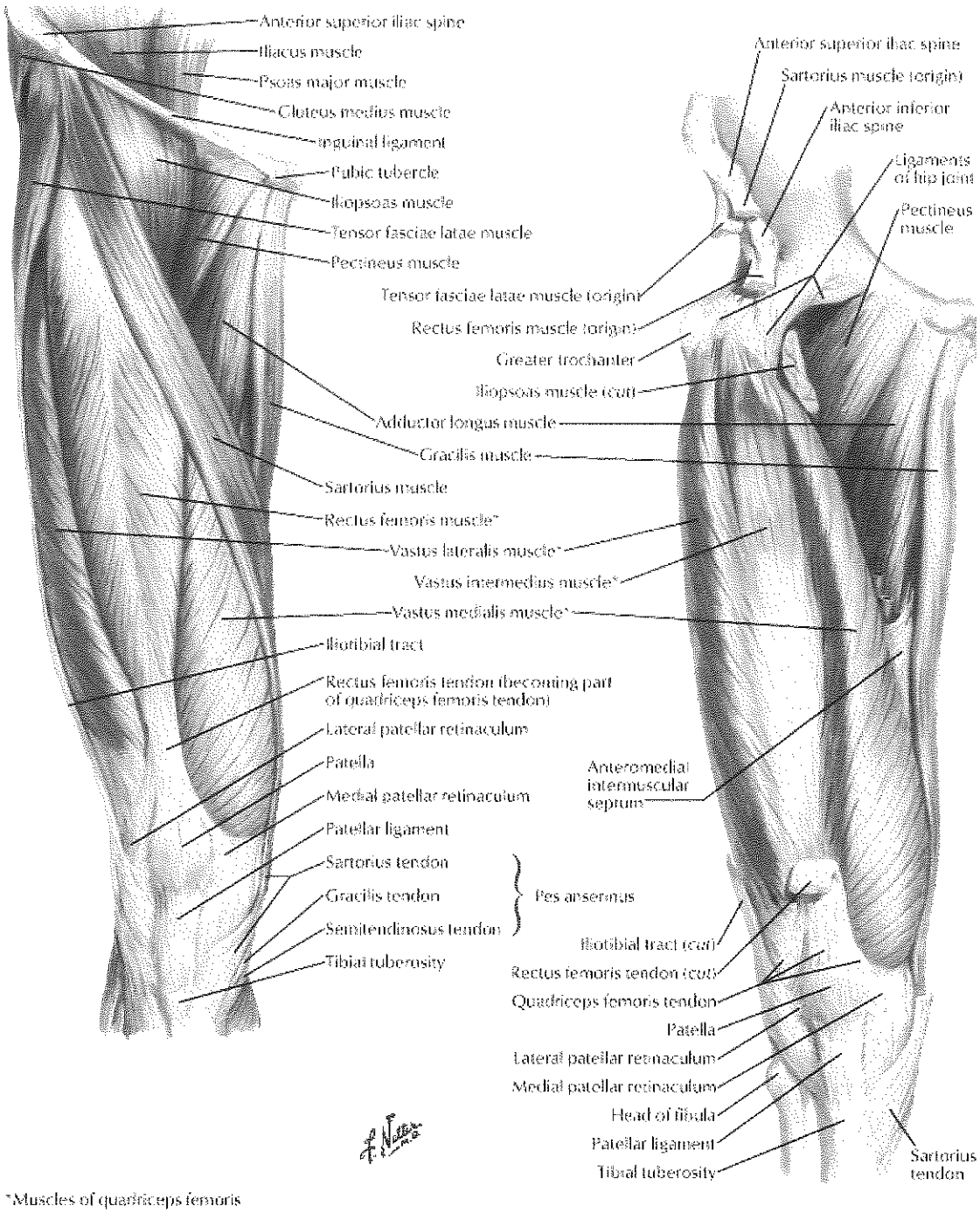


Figure 4.80 Front view of thigh musculature (Quads). Look at all that muscle! These are what propel you in your every day activities so keep them strong! Reprinted with permission—Courtesy of Elsevier, Inc.

WALL SQUATS (thighs/quads)

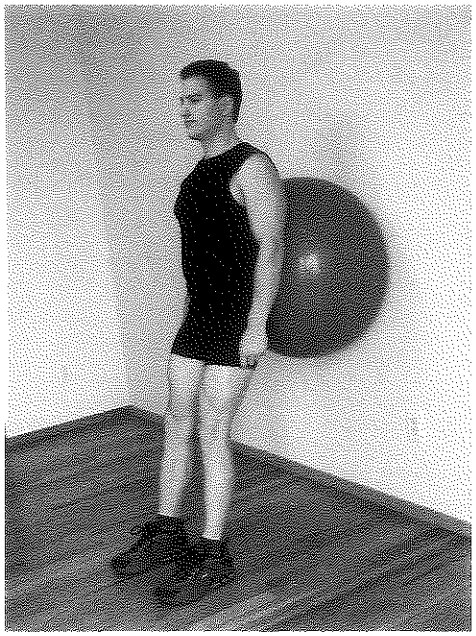


Figure 4.81 Wall squats starting position

Starting Position (figure 4.81): Start with you feet about shoulder width and slightly toed out with your knees straight but not locked or hyper-extended. Your feet should be in front of the plane of the body (in front of the ball) by about a foot and a half. You should feel the ball resting in your low back. If you do not have a ball it is fine to use a wall.

Midpoint (figure 4.82): Inhale as you slowly bend your knees and lower yourself keeping your back straight. Stop the descent at around 90 degrees of knee flexion. This will help take some of the stress off your knees. If it hurts to go this low do not go as far down the next repetition—some is better than none. *At the bottom of the squat also be sure that your knees are behind your toes as this minimizes the shear force on your knees.*

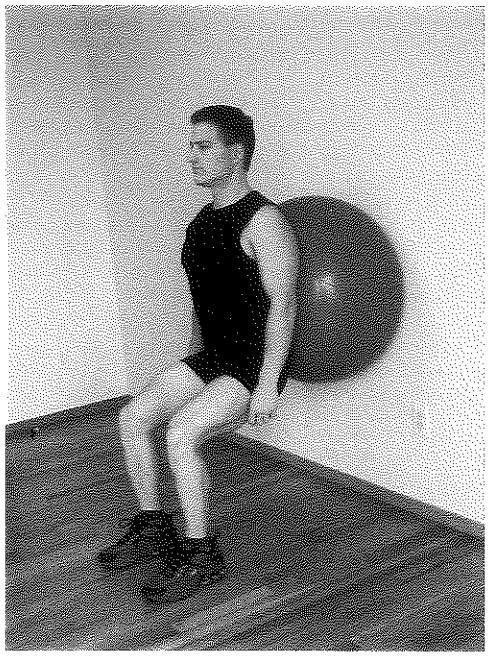


Figure 4.82 Wall squats midpoint

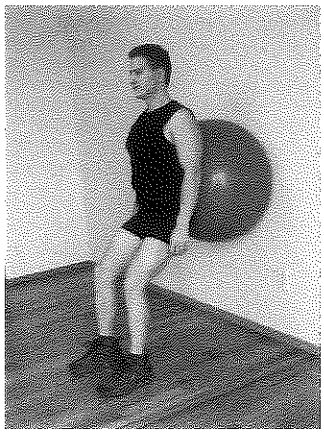


Figure 4.83 Tip for wall squats

Tip (figure 4.83): If your knees hurt when doing this exercise do not go as low and often that will take away the pain.

STEP UPS—FRONT (thighs/quads)

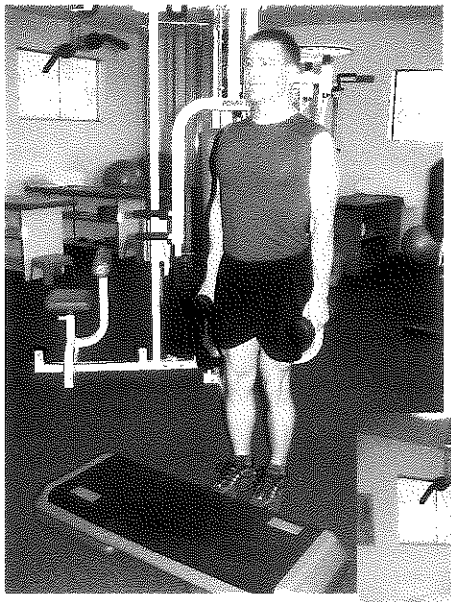


Figure 4.84 Step ups (front) starting position

Starting Position (figure 4.84): Stand in front of a 4 to 6 inch step as shown (a regular step in your staircase will work just fine). Start without using dumbbells and later add dumbbells for extra resistance as you get stronger. Remember to use proper posture keeping shoulders back with an inward curve in low back—abs tight.

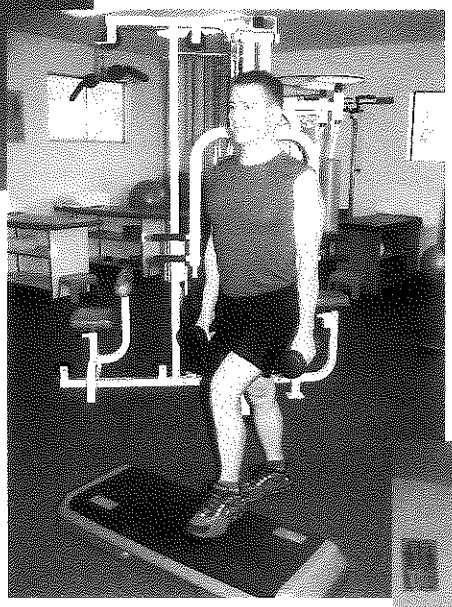


Figure 4.85 Step ups (front) midpoint

Midpoint (figures 4.85 and 4.86): Step onto the step being sure to take a big enough step so that you can keep your knee behind your toes. Now step up with the opposite foot. Step down, one foot at a time, back to the starting position. Repeat again but this time lead with the opposite foot as what you lead with the last time you stepped up. Alternate lead foot with each repetition.

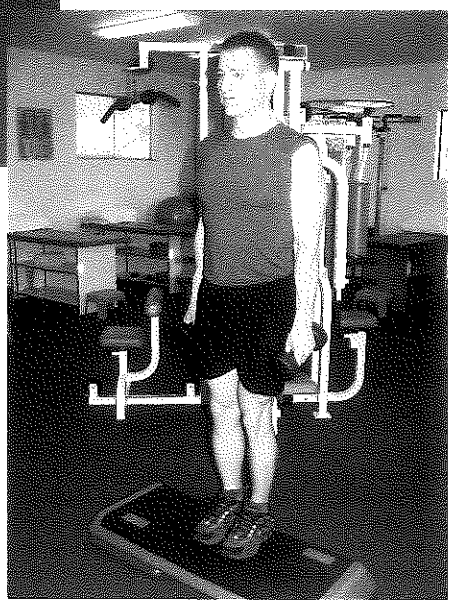


Figure 4.86 Step ups (front) midpoint

Note: This is a great exercise because it is very functional. We all need to be able to go up and down steps. Even better yet, it does not require any equipment as all you really need is a step—any staircase will do.

DUMBBELL SQUATS (thighs/quads)

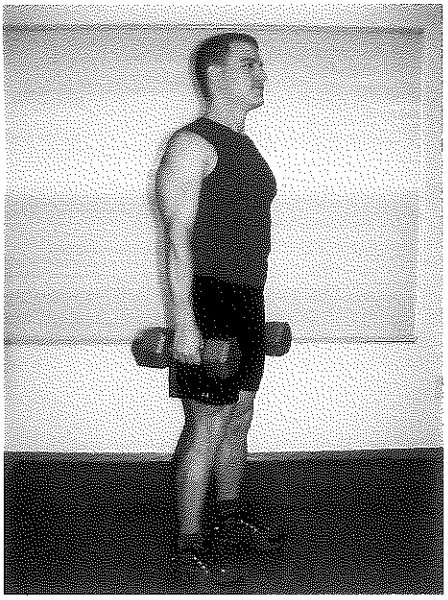


Figure 4.87 Dumbbell squat starting position

Starting Position (figure 4.87): Start with you feet about shoulder width and slightly toed out with your knees straight but not locked or hyper-extended.

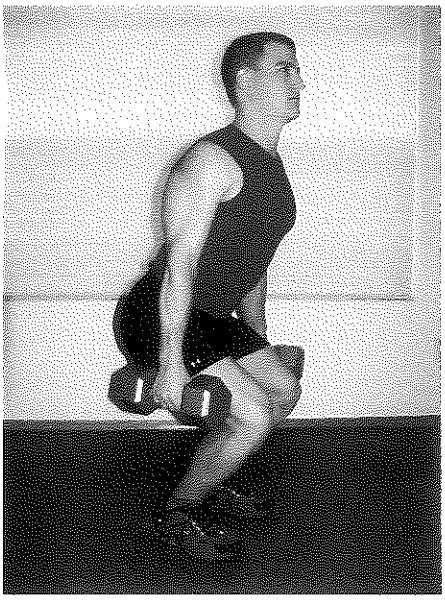


Figure 4.88 Dumbbell squat midpoint

Midpoint (figure 4.88): Inhale as you slowly bend your knees while maintaining and inward curve in your low back (lordosis). Stop the descent at or just before you get to a 90 degree angle of knee flexion/bend. This will help take some of the stress off your knees. If it hurts to go this low do not go as far down the next repetition—some is better than none.

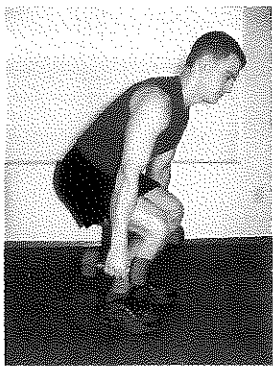


Figure 4.89 Tip for dumbbell squat

Tip (figure 4.89): Do not round your back forward as this places increased stress on your spinal discs and muscles. Be good to your back. There are enough other ways to make your back sore.

Tip (figure 4.90): As shown on right, do not bend your knees too deep. Over time it will accelerate the wear and tear on your valuable knees.

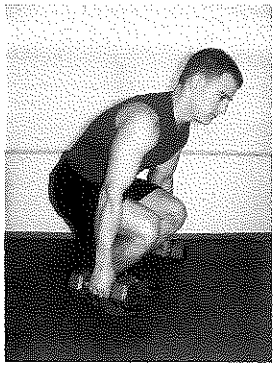


Figure 4.90 Tip for dumbbell squat

STEP UPS—LATERAL (thighs/quads)

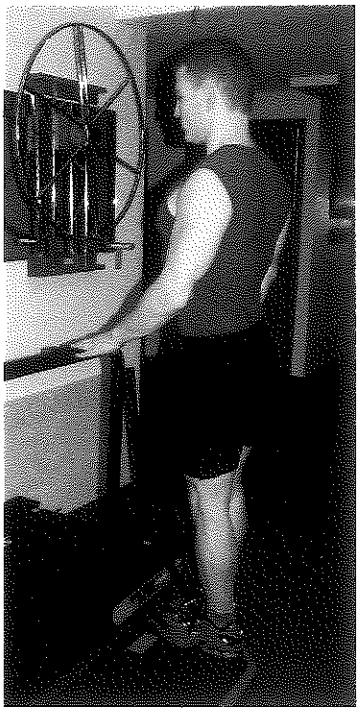


Figure 4.91 Step ups (lateral) starting position

Starting Position (figure 4.91): While hanging onto a railing or wall for balance, stand with one foot on a 4 to 6 inch step and the other foot suspended on the air. Use only minimal upper body support to keep your balance as we want your muscles to do as much work as possible. This exercise will also develop your balance if done properly.

Midpoint (figure 4.92): Lower your body very SLOWLY so that your suspended foot (non-step foot) barely touches the ground but not with your full body weight. Keep your knee behind your toes and your body up straight while maintaining the curve in your low back. Return to the starting position. Control is the name of the game with this exercise. If done slowly this exercise is extremely hard. However, if you do it quickly it will have little benefit.

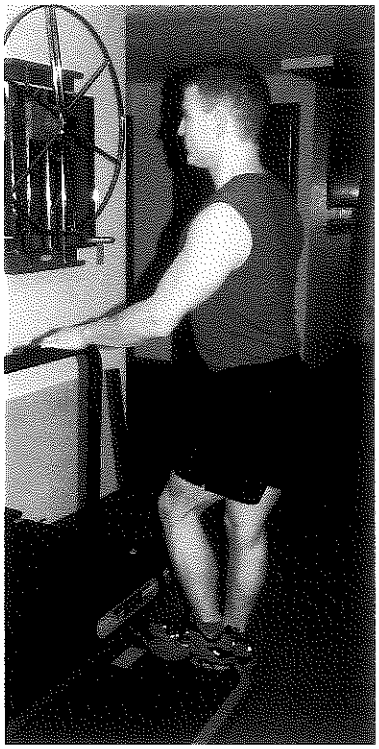


Figure 4.92 Step ups (lateral) midpoint

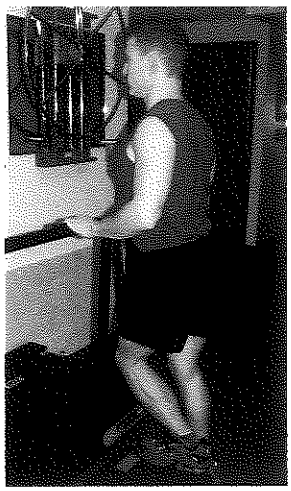


Figure 4.93 Tip for step ups (lateral)

Tip (figure 4.93): Do not allow your knee to move in front of your toes as shown. This places a lot of shear force on your knee and will make it sore in a hurry! As with the other exercises if it hurts to touch your foot to the floor do not go as low thereby limiting the range of motion to the non-painful range.

LEG PRESS (thigh/quads)

Leg press is a great exercise as it is one of the few ways to really work your thighs hard without damaging your low back. Most other exercises (see yellow and red light chapters) place way too much stress on your low back to be useful. The problem is that your low extremity is a lot stronger than your low back so it is best to bypass the back to work the lower extremity. The leg press accomplishes this perfectly so it should be a staple exercise of your workout if possible. Perform wall squats if you do not have a leg press.

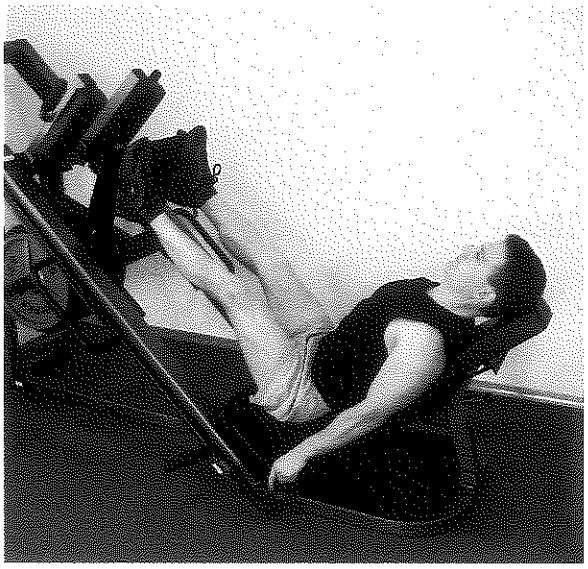


Figure 4.94 Leg press starting position

Starting Position (figure 4.94): Get on a leg press machine as shown with your feet about shoulder width apart slightly toed out and knees straight. If helps to take some of the strain off your low back if the back rest can be reclined 30-50 degrees. The closer the backrest angle is to 90 degrees the harder it will be on your low back.

Note: When performed correctly, leg press is a great exercise for the legs—one of my favorites!

Midpoint (figure 4.95): Inhale as you slowly lower the weight until your knees are bent at about a 90 degree angle. Your knees should also be behind your toes in this position. Now exhale as you press the weight upwards until your knees are straight. Pause briefly at the top and keep your quads flexed the whole time—it isn't time to rest yet.

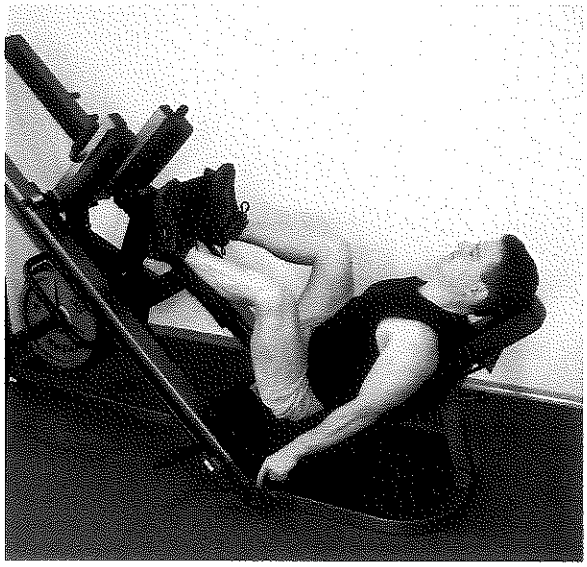


Figure 4.95 Leg press midpoint

Tip: Do not flex your knees as far as they can go at the bottom of the movement as over time it will damage your knees. Also be sure to keep your abdominals tights during this exercise and spine straight. If it hurts your knees to bend them to 90 degrees try not going as low and/or check your foot position to make sure that you knees are not in front of your toes.

HAMSTRINGS

The three hamstring muscles are the Biceps Femoris, Semitendinos, and Semimembranosus—see figure below. These powerful muscles bend the knee but also can extend the hip and trunk depending on what you are doing. Along with the quadriceps, these muscles help to move you forward.

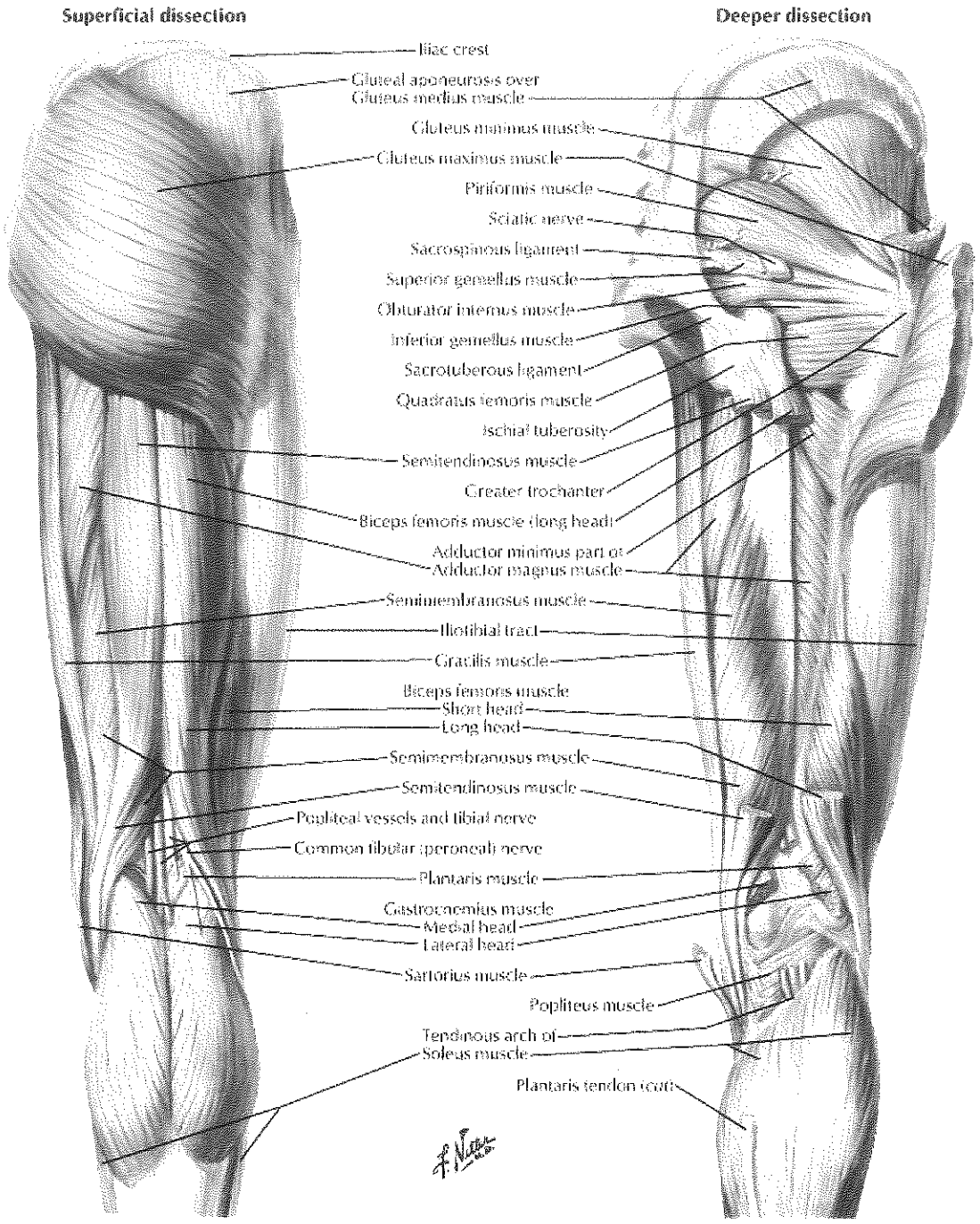


Figure 4.96 Back view of lower extremity in which hamstrings and calves can be viewed. Reprinted with permission—Courtesy of Elsevier, Inc.

FORWARD LUNGE (hamstrings)

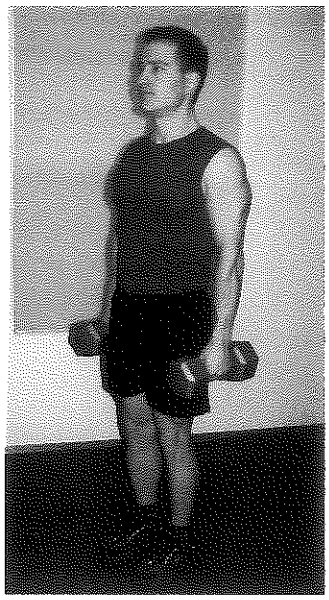


Figure 4.97 Forward lunge starting position

Starting Position (figure 4.97): Stand feet shoulder width apart with or without dumbbells. (If you are new to this exercise do not use dumbbells but if you have mastered the form and are ready for a greater challenge then use light weight as needed.) Although I have this exercise listed as a hamstring exercise, in reality, the quads and hamstrings are working together.

Midpoint (figure 4.98): Take a medium to large step and slowly lower your knee to a 90 degree angle being sure to keep your knee behind your toes. Keep your chest up, back straight and abdominal muscles tight. It is OK to slightly bend your opposite knee and allow its heel to rise as shown on the right. Pause and then accelerate back to the starting position. Repeat with the opposite side. As with other knee exercises if this hurts do not go as low. Some lunge is better than no lunge.

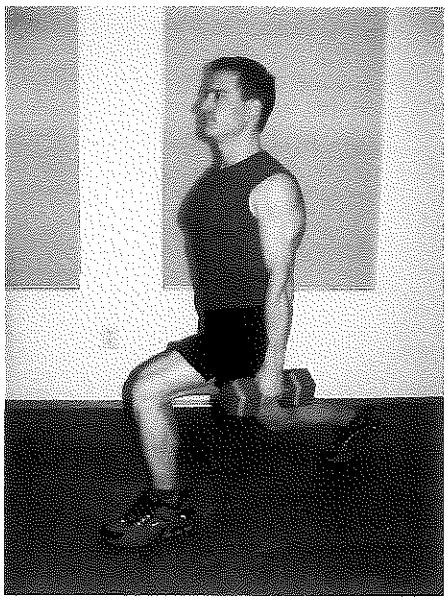


Figure 4.98 Forward lunge midpoint

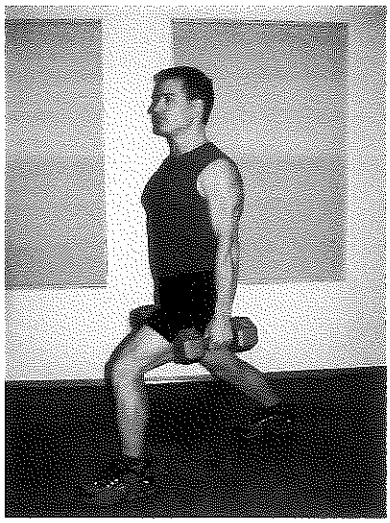


Figure 4.99 Tip for forward lunge

Tip (figure 4.99): *If you knee hurts take a shallower lunge as shown on left.* Most people want to go way to low with this exercise as well as too fast. Emphasize the lowering (eccentric) phase of this movement, pause at the bottom and then accelerate back to the starting position. This exercise is great for strength and balance!

FORWARD LUNGE CONTINUED...

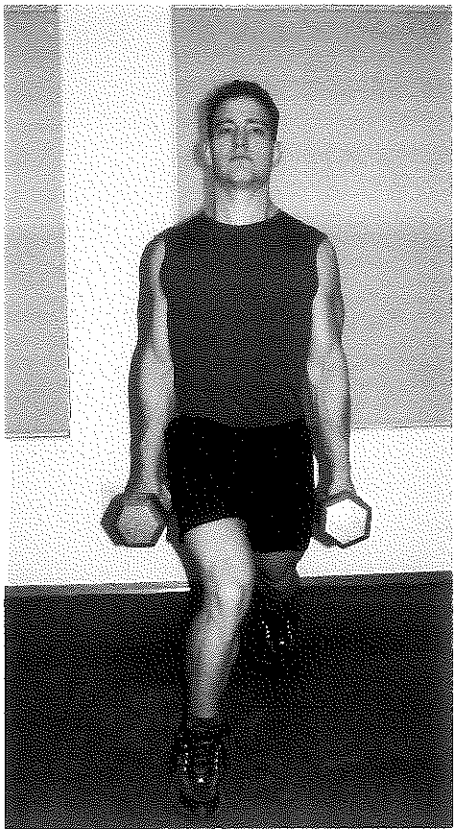


Figure 4.100 Tip for forward lunge—do not allow your knee to drift inwards, towards the midline.

IMPORTANT TIP (figure 4.100): If you can watch your knee from the front in a mirror be sure that the front lunging knee does not drift inwards (as shown in this picture). This is called genu valgus and is extremely destructive to the knee. Only perform this exercise if you have the control to keep everything in alignment. Your knee is meant to bend and straighten. It does not take kindly to being bent sideways. Notice the frown on my face because my knee is unhappy. See below for proper positioning.

Tip (figure 4.101): Proper form with leading knee as straight as an arrow. Notice that I am smiling now because my knee feels good!

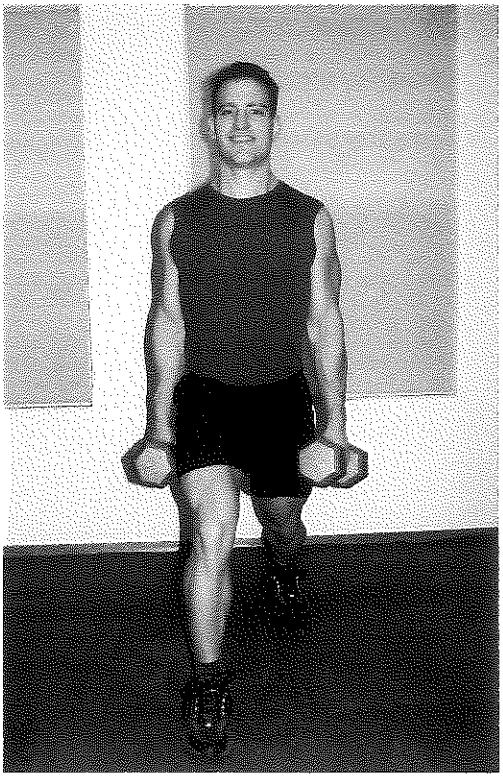
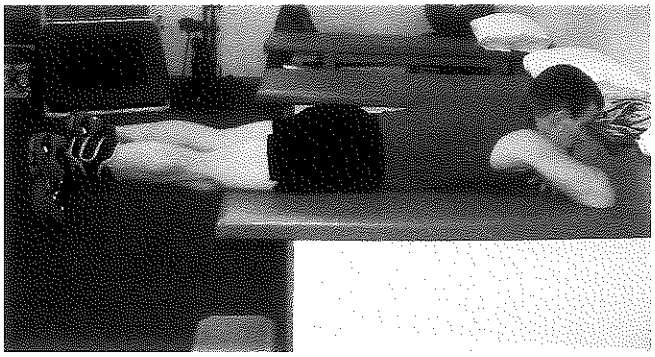


Figure 4.101 Tip for forward lunge—keep your knee straight while performing the lunge—this will help it feel good!

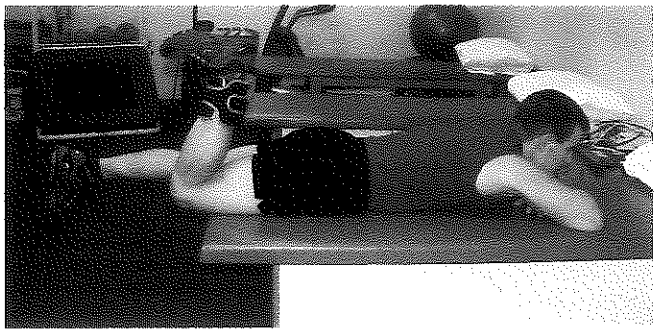
Note: Lunges are a great exercise but they must be done properly. Just ask your knees. Be aware that lunges can also be done backwards or with a slide board for variety.

PRONE HAMSTRING CURLS—with ankle weight (hamstrings)



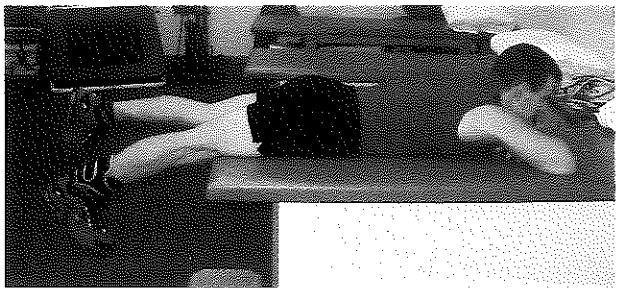
Starting Position (figure 4.102): Lie on table or bed with weight firmly secured around your ankle. Back should be straight and abdominals tight. Be sure and use a weight that you can handle in good form without bouncing, jerking or arching your low back. Do not allow your knee to hyperextend.

Figure 4.102 Prone hamstring curls starting position



Midpoint (figure 4.103): Lift the weight as you exhale until your knees are bent to around 90 degrees—greater than 90 degrees is OK in this case. Pause, and then slowly lower the weight to the starting position. Keep your abdominals tight so that your back does not over-arch (hyperextend).

Figure 4.103 Prone hamstring curls midpoint



Tip (figure 4.104): Do not allow your knee to hyperextend in the starting position or between repetitions.

Figure 4.104 Tip for prone hamstring curls—do not allow your knee to hyperextend backwards. Ouch!

STANDING HAMSTRING CURLS—with ankle weight (hamstrings)

If you do not have a good place to perform prone hamstring curls or machine curls then you can always perform them in the standing position.

Figure 4.105 Standing hamstring curls starting position

Starting Position (figure 4.105): Stand as shown with an ankle weight firmly secured around your lower leg. Stand next to a table, counter or wall so that you can balance using your hands during the midpoint of the exercise.

Figure 4.106 Standing hamstring curls midpoint

Midpoint (figure 4.106): Slowly lift the weight by bending your knee until you are at, or just beyond, 90 degrees of knee bend (flexion). If your hamstring cramp at this point do not left as high during the next repetition or take a break, stretch your hamstrings, and then resume the exercise. Slowly lower, with control, to the starting position.

HAMSTRING CURL MACHINE (hamstrings)

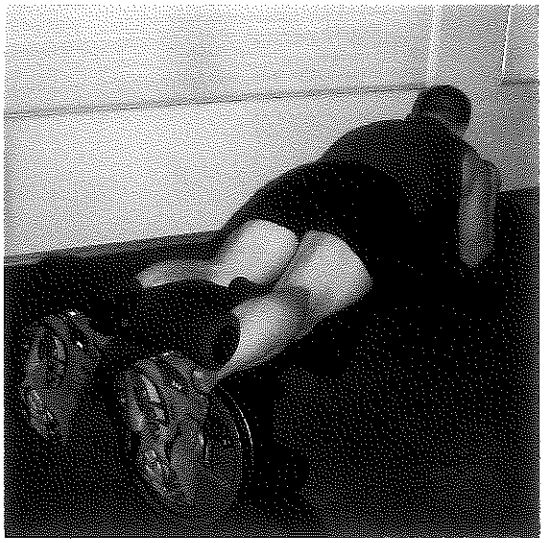


Figure 4.107 Hamstring curl machine starting position

Starting Position (figure 4.107): Lie on a leg curl machine as shown with the ankle pad adjusted so it is just above your ankles. Back should be straight and abdominals tight. Be sure and use a weight that you can handle in good form without bouncing, jerking or arching your low back.

Midpoint (figure 4.108): Lift the weight as you exhale until your knees are bent to around 90 degrees—greater than 90 degrees is OK in this case. Pause, and then slowly lower the weight to the starting position. Keep your abdominals tight so that your back doesn't get hurt.

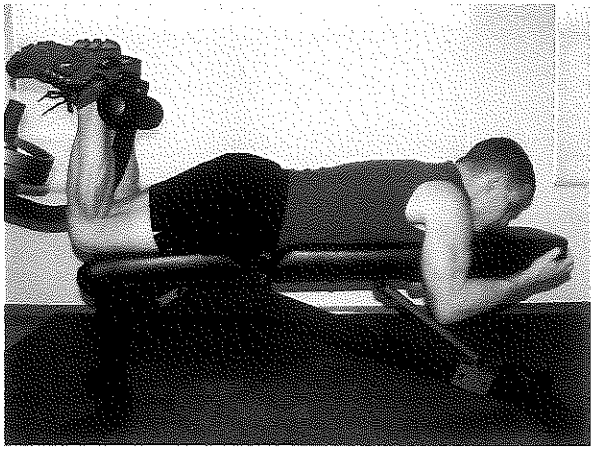


Figure 4.108 Hamstring curl machine midpoint

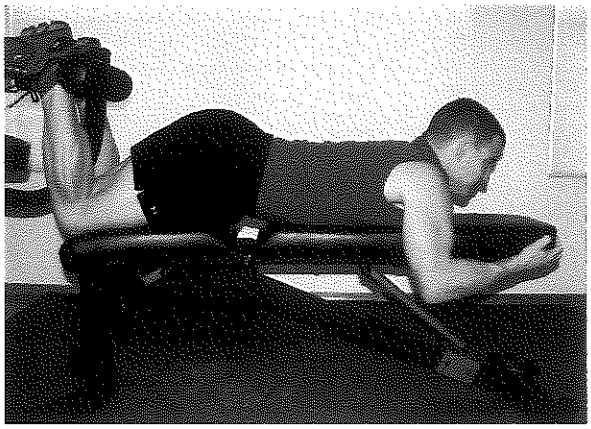


Figure 4.109 Tip for hamstring curl machine—do not allow your back to hyperextend.

Tip (figure 4.109): Do not allow your hips to pop up or your back to hyperextend as this places undue stress on your low back. Instead, keep your abdominals tight and keep those hips locked in place.

Note: Some hamstring curl machines are set up so that you work one leg at a time in the standing position. This is completely safe. Feel free to try the hamstring curls in different ways and pick the method that you like the best given your choices of equipment. Personally, I like to use the hamstring curl machine as it really isolates the hamstrings.

CALVES/LEGS

The calves are technically made up of a few major muscle groups that together insert to the back of your heel (calcaneus) by way of the Achilles tendon. The two muscle groups that make of the "calf" muscle are the Gastrocnemius (the outer visible part of the calf with a medial and lateral head) and the underlying Soleus muscle. The Soleus muscle gets its name because it lies flat against the tibia sandwiched between the overlying Gastrocnemius and underlying tibia to which it originates. Both these muscles combine to the common tendon, the Achilles tendon, just before attaching to the heel. These extremely powerful muscles are what allow you to have "push off" and left your heels so that you can stand on your tip toes. The calf muscles are also critical for balance in both static and dynamic situations. If your balance is poor, you cannot afford to skip working your calves!

Some people in an effort to target the medial and lateral heads of the calves (Gastrocnemius) will turn their heels in and out during some form of calf raise exercise. While this practice will unlikely result in injury, in also will be unlikely to target any different portion of the Gastrocnemius. Because of the Gastrocnemius' common insertion to the Achilles tendon, there really is not a way to preferentially isolate the heads of this muscle. Therefore, I prefer to perform my calf raises straight ahead always and have had good results. Focus on controlled and solid muscle contractions as that is what will make you stronger---muscle fiber recruitment! Please see figure 4.96 for a drawing of the Gastrocnemius and Soleus muscles with labels.

STANDING CALF RAISE (calves)

Figure 4.110 Standing calf raise starting position

Starting Position (figure 4.110): Stand in a stairwell or level ground. If on a step, place ball of your feet on the step with heel slightly below stair surface. Feet should be about shoulder width apart. Balance with hands using a nearby wall or railing.

Figure 4.111 Standing calf raise midpoint

Midpoint (figure 4.111): Slowly lower your body to a position of gentle stretch on the calf muscle. Pause for a moment at the bottom, then press up on your toes as high as possible. Hold for a 1-2 count and then lower your body again to starting position.

Note: You can progress to a standing one-leg calf raise as you get stronger—see next exercise. I think that you will find that your bodyweight is a very effective way to strengthen your muscles when done consistently.

ONE-LEG CALF RAISE (calves)

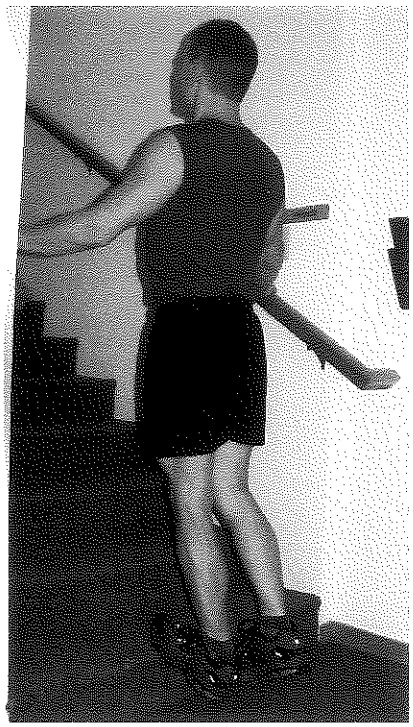


Figure 4.112 One-leg standing calf raise starting position

Starting Position (figure 4.112): Stand in a stairwell or level ground. If on a step, place ball of your foot on the step with heel below stair surface. Keep opposite foot suspended in the air. Balance with hands using a nearby wall, railing or counter.

Midpoint (figure 4.113): Slowly lower your body to a position of gentle stretch on the calf muscle. Pause for a moment at the bottom, then press up on your toes as high as possible. Hold for a 1 count and then lower your body again to starting position.

Figure 4.113 One-leg standing calf raise midpoint

Note: If this exercise becomes easy you can always hold a dumbbell in one of your hands for extra resistance.

CALF RAISES ON LEG PRESS (calves)

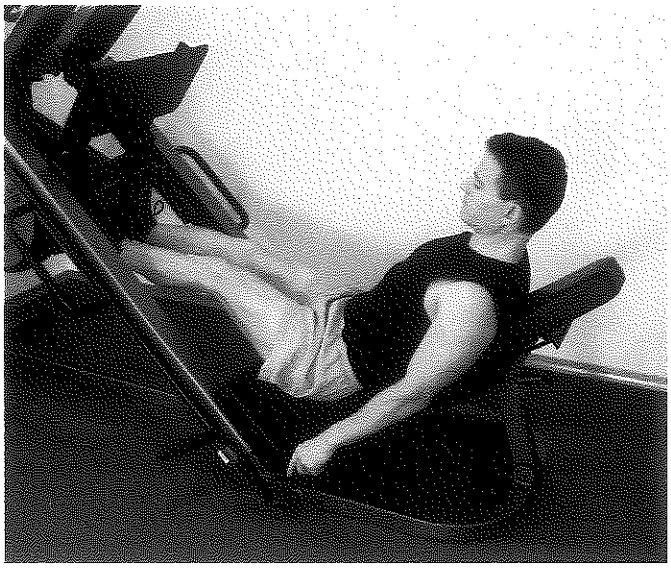


Figure 4.114 Calf raise on leg press starting position

Starting Position (figure 4.114): Position yourself on leg press as shown with balls of feet on toe plate, feet shoulder width or slightly narrower. Your knees should be straight or slightly flexed but not locked or hyper-extended. Do not move your feet so far towards your toes that your feet slip off the platform!

Midpoint (figure 4.115): Keeping your knees fixed press upwards by flexing your calf muscles and pressing up onto your toes as much as possible. Pause for a moment and then slowly lower to a position of slight stretch at the bottom.

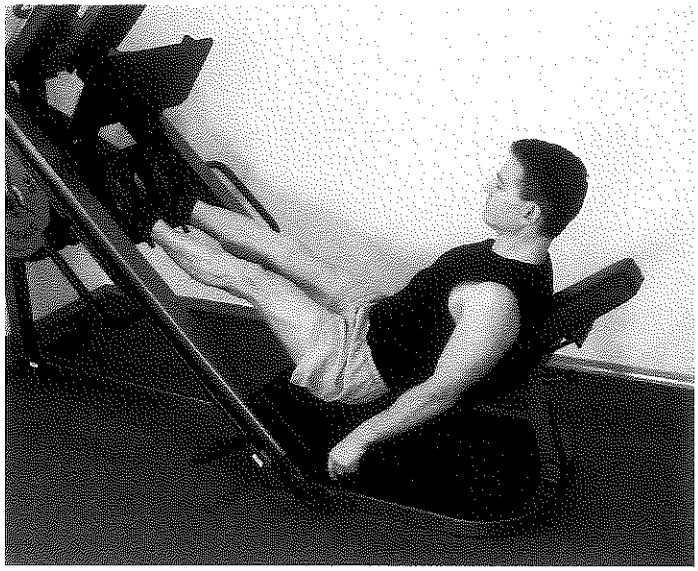


Figure 4.115 Calf raise on leg press midpoint

Note: This and standing calf raises in the stairwell are two of my favorite ways to work the calve muscles. I usually do a set of calf raises either before or after my leg press set. This helps to keep the workout moving.

SEATED CALF RAISE MACHINE (calves)

This exercise targets the Soleus muscle due to the bent knee (flexed) position from being seated. Because the Gastrocnemius muscle crosses the back of the knee, placing the knee in a bent position puts the Gastrocnemius "on slack" but leaves the underlying Soleus under tension. Since the Soleus muscle does not cross the knee, it is left under maximum tension to do much of the work during the calf raise.

Starting Position: Sit on a calf raise machine with thigh pads of machine comfortably positioned. Balls of feet should be positioned on foot plate at about a spacing of shoulder width or slightly narrower if it is more comfortable.

Midpoint: Lift weight by squeezing calf muscles until you are in a tip-toe position on balls of feet. Pause for a moment, and then slowly return to the starting position.

Note: Although not as convenient, you can also perform this exercise by sitting on the edge of a bench and placing a barbell perpendicular to your thighs.

STANDING CALF RAISE MACHINE (see yellow light chapter)

This exercise is placed in the yellow light chapter because it places compressive forces on the spine. Therefore, most people are better off using their bodyweight or a leg press machine to exercise their calves.

A note on "new" exercises & adding variety to a workout:

Although exercise can sometimes get somewhat monotonous the fact is that there are only so many truly safe exercises to choose from and this is how some people get hurt. They pick an inferior "new" exercise in an effort to add variety and get injured in the process. A better way to add variety is to stick with a core group of key exercises and rotate every so often—say every 3-6 months. Another way to add variety is to vary the weight/repetitions (this is called periodization)--occasionally do more reps with a lighter weight and go for the burn or more weight and fewer reps! Remember, muscular burn is OK, but not sharp joint pain. Be mindful of the difference because you are a smart weight lifter who wants to lift through life! Another great way to add variety is with drop sets. Drops sets are great to try occasionally for something different. With drop sets you do your regular set, immediately drop the weight and then perform another set without rest for up to two or three additional sets. Drop sets are best reserved for advanced weight lifters however.

CHAPTER 5: YELLOW LIGHT (POTENTIALLY RISKY) EXERCISES—proceed with caution and keep form very strict: (for intermediate and advanced lifters)

The classification for exercises falling into the yellow light category is purely a matter of physics applied to the body. Yellow light exercises use longer lever arms and/or place compressive and/or shear forces on the joints and muscles that they work so caution must be exercised. With exercise, the old adage "When in doubt, don't" applies here. It should also be highlighted that *most of the thigh/leg exercises in this chapter are placed in the yellow light category because they do place compressive forces on the spine*. If you have back pain or a history of back pain and/or surgery, then you should not perform any of the thigh/leg exercises performed in this chapter without medical approval. Instead, stick with exercise outlined in the green light chapter.

Yellow light exercises can be safe when proper form is used and appropriate weight is selected but they are more injury prone than the green light exercises. The only exercises in this book that people should never perform (unless special circumstances apply, i.e. professional athletes) are the exercises that have been labeled "red light."

Put simply, if you already have pain in a joint that a yellow light exercise will stress (i.e. shoulder pain) then it would be best to hold off on that specific exercise until that pain has resolved. If you resume a yellow light exercise and the pain returns then it is best to avoid that exercise completely—hence the name "yellow light" for the greater potential for injury. Beginners should not start with yellow light exercises. It is better to start with the green light exercises so that you can be successful and minimize your risk of pain or injury. Once you have built up a base of strength and are ready for more variety, then you can consider adding some of the yellow light exercises to your routine although that is not mandatory.

A "rationale" will be given for all yellow light exercises so you can understand why a particular exercise was placed in this category. The rationale will also teach you some general principles that can be applied to any exercise that you might perform in or out of the gym.

In summary, yellow light exercises mean that you should proceed with caution but keep form very strict with light to medium weight. It is generally better to work in the higher repetition range (12 to 20 reps) with these exercises so that excessive weight is not used. If you have pain in a region that a yellow light exercise involves, then you would be wise to stick with a green light exercise instead.

CHEST

DUMBBELL FLY (chest)

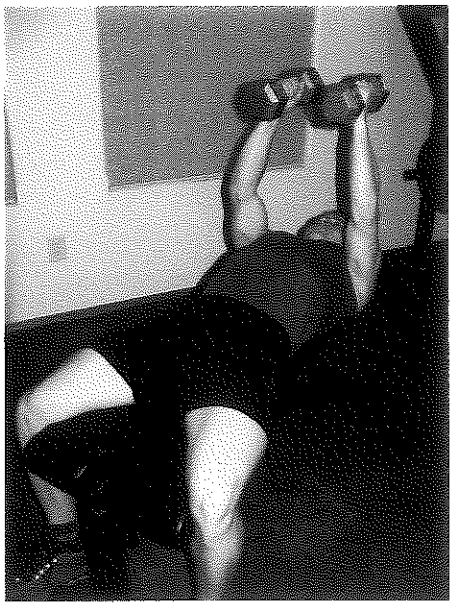


Figure 5.1 Dumbbell fly starting position

Starting Position (figure 5.1): Sit on the end of a bench with dumbbells on your thighs. Lie back and bring dumbbells to a position against your shoulders. Now press the dumbbells over your chest and you are ready to begin the exercise. Keep the dumbbells over your chest or at shoulder level.

Figure 5.2 Dumbbell fly midpoint

Midpoint (figure 5.2): Slowly lower the weights while keeping your *elbows bent* like you are hugging a tree. Bending the elbows is important as it helps reduce the leverage on your rotator cuff muscles. Stop when your elbows are roughly even with your shoulders or bench.

Note: Please see next page for tips on dumbbell flys to avoid injury.

DUMBBELL FLY CONTINUED... (Chest)

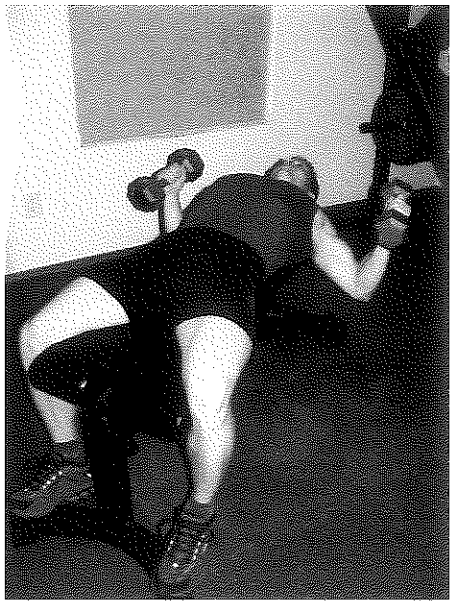


Figure 5.3 Tip for dumbbell flys—do not let your arms drop too low past the plane of the body.

Important Tip! (figure 5.3): Do not let your elbows drop too far below the bench or you can injure your shoulders. A good rule of thumb is to stop when your arms (not forearms) are parallel with your body.

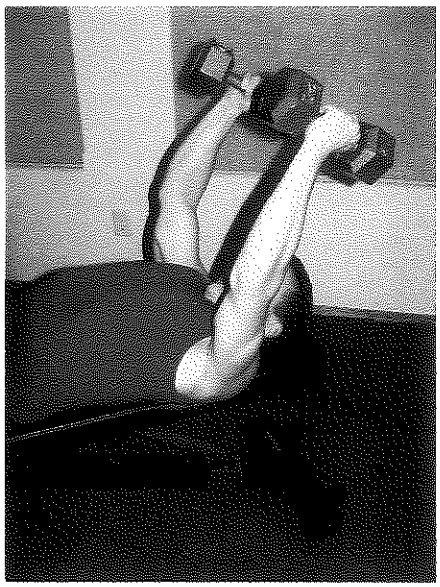


Figure 5.4 Tip for dumbbell flys—do not allow hands to move above shoulder level.

Tip (figure 5.4): Do not allow the dumbbells to move above shoulder level in the starting position as it will place your shoulders in a vulnerable position and could lead to an "impingement syndrome"—a painful tendonitis condition of the rotator cuff.

MACHINE FLY (chest)

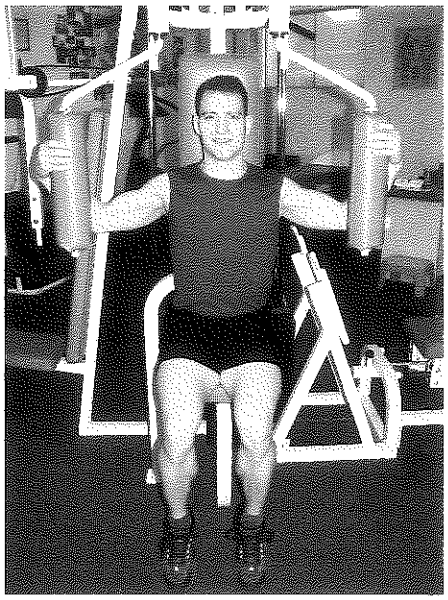


Figure 5.5 Machine fly starting position

Starting Position (figure 5.5): This works the same muscles as dumbbell flys, however, now you are using a machine with elbow pads (as shown) or hand grips. Position hands on pads so that your elbows are slightly lower than shoulder level (this will keep your shoulders out of the impingement zone). In addition, do not allow your hands or elbows to move past the plane of your body, as this will overstress the front of your shoulders (rotator cuff). I do prefer dumbbell flys to machine flys because they feel more comfortable. The dumbbells allow your body to find its own natural movement pattern.

Midpoint (figure 5.6): Exhale you as squeeze elbows together. Pause for a moment and then slowly return to the starting position being sure to stop the motion before your hands or elbows move past the plane of the body. If it hurts to stretch at the end of the motion temporarily limit the range of motion and give your shoulders time to adapt.

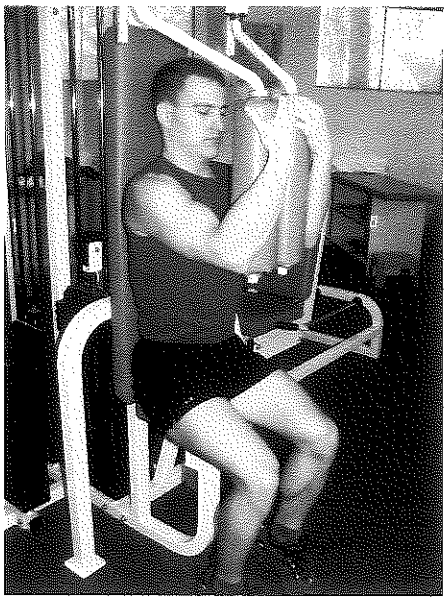


Figure 5.6 Machine fly midpoint

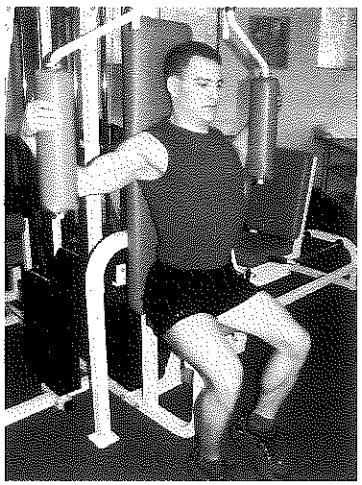


Figure 5.7 Tip for machine fly—do not let your elbows move past the plane of the body.

Tip (figure 5.7): DO NOT allow your elbows or hands to go past the plane of your body as this will over stress and possibly injure your shoulders. When starting or finishing a set be sure and grab one forearm pad at a time, turning your body and then grabbing/releasing the other arm pad to protect your shoulders. Many people just finish the set and then let their arms just stretch back way past the plane of the body. Protect your shoulders during the set but also at the start and completion of each set.

INCLINE BENCH PRESS--DUBBELLS OR BARELL (upper chest)

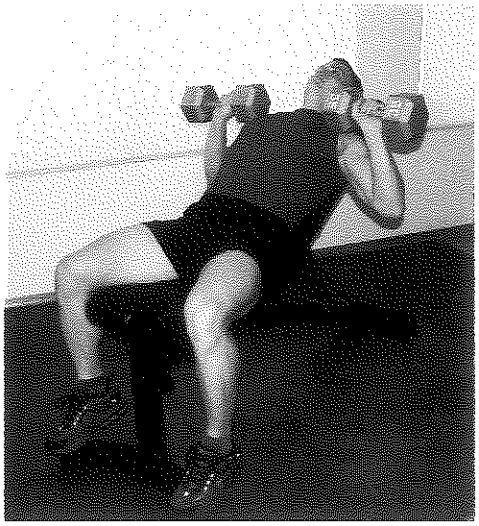


Figure 5.8 Incline bench press starting position

Starting Position (figure 5.8): Sit on incline bench set at a 30-45 degree angle. Lie back on the bench press and use each thigh, one at a time, to help lift the dumbbell to over your upper chest. Your elbows should be away from your sides (abducted) about 45-50 degrees.
Note: Sometimes dumbbells are tolerated better than a bar.

Midpoint (figure 5.9): Exhale as you smoothly press the dumbbells slightly above shoulder level. Pause for a second while squeezing your upper chest and then slowly lower to the starting position as you inhale.

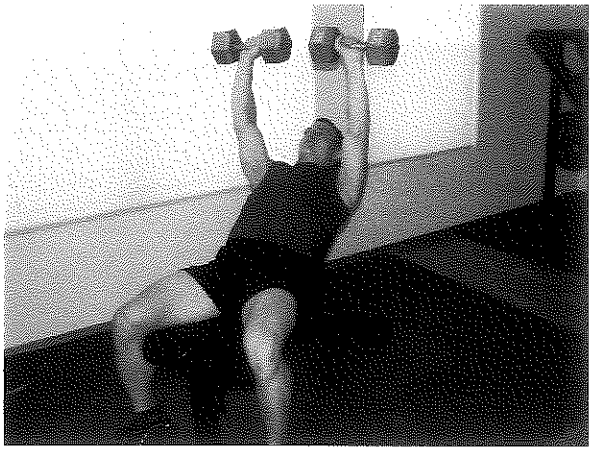


Figure 5.9 Incline bench press midpoint

Rationale (figure 5.10): I gave this exercise a lot of analysis before placing it in the yellow light category as it is a good exercise for working the upper chest. However, I have seen it injure a lot of my patients' shoulders and have certainly irritated my own with this exercise. The problem is that you must press through 90 degrees of shoulder elevation (see picture) as you move to the finish position. Unfortunately, it is around this 90 degree range as your hands move overhead and your elbows move above shoulder level where the impingement zone exists. Very few people can perform this exercise long term without having shoulder pain. If your shoulders hurt and you have been performing this exercise it is the first exercise to suspect and the one that I would eliminate. Granted, some people seem to be able to perform this exercise without pain or injury but they are in the minority. The purpose here is to flag this exercise so that if you start to have pain you can track down the culprit.

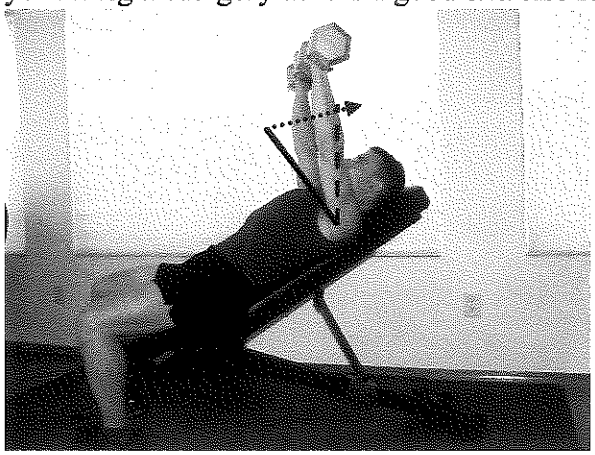


Figure 5.10 Rationale for incline bench press showing arc of motion in impingement zone.

BACK

Most back exercises are either safe (green light) or horribly destructive (red light). For this reason there is only one exercise that I will highlight with which to use caution (yellow light). With that said, know that I do perform these on a regular basis but am very cautious with my form.

SEATED CABLE ROW (back—horizontal fibers)

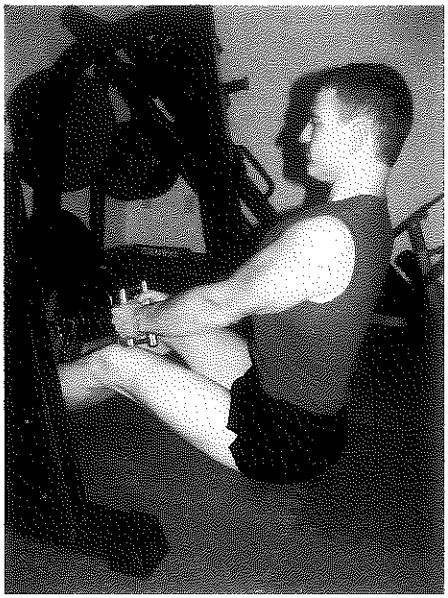


Figure 5.11 Seated cable row starting position

Starting Position (figure 5.11): Sit on a seated cable rowing machine with an inward curve in your lower back, knees slightly bent and your feet about shoulder width apart. Arms should be outstretched in front of your body grasping a V-bar, attached to a low pulley cable, with thumbs pointing up. You should be *sitting up straight* with your shoulders back. Proper posture is key with this exercise.

Midpoint (figure 5.12): Inhale as you squeeze your shoulder blades towards your spine while you pull the V-bar towards your ribcage. Stop once your wrists are against your sides. Most of this movement will come from your shoulder blades if you do it right. Do not try to pull your wrists and elbows past the plane of your body as it will overstretch the front of your shoulders. Try and keep your elbows at or near your sides as this will help protect your shoulders. DO NOT round your back forward or backwards during the movement or use momentum to move the weight.

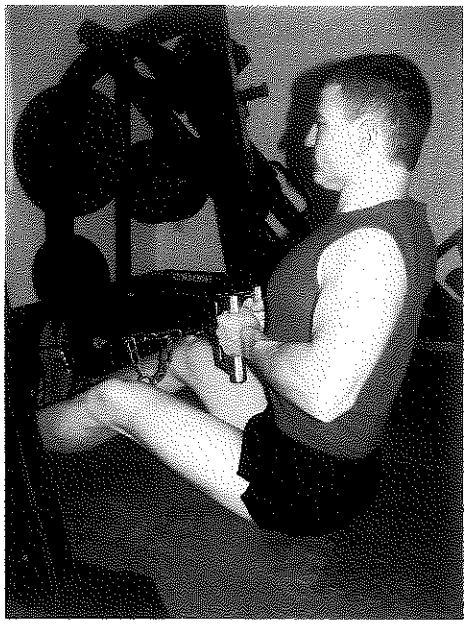


Figure 5.12 Seated cable row midpoint

Note: For important tips on seated cable row see next page.

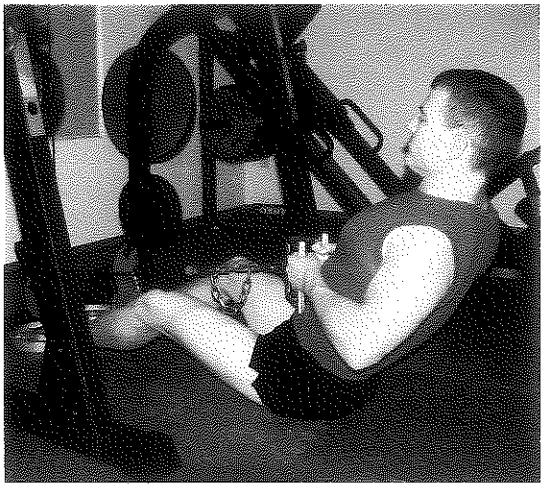


Figure 5.13 Tip for cable rows—do not lean back too far.

Tip (figure 5.13): Do not lean back like you are water skiing!

Tip (figure 5.14): At the other extreme DO NOT round your back like a humpback whale either. Ouch!

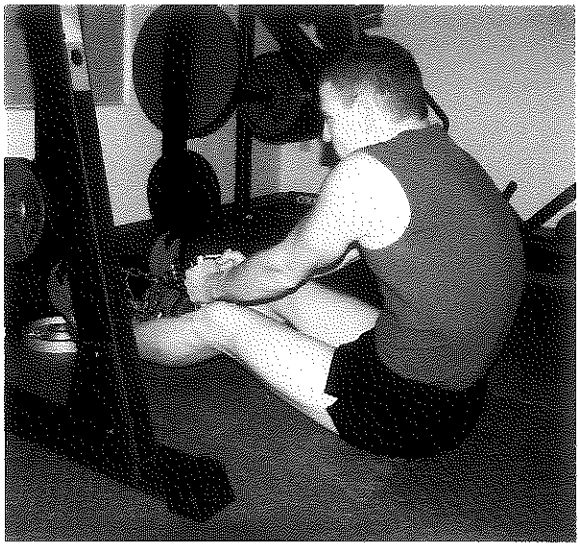


Figure 5.14 Tip for cable rows—do not round your back forward.

Rationale: If my lower back is sore I take a break from this exercise for a day or two. This exercise can be quite safe when performed properly but extreme care must be taken to maintain the inward curve of your low back. I prefer the standing position, as opposed to a seated position, as this places less pressure on your low back. If you have a history of low back injury or surgery, I strongly recommend that you perform rowing exercises with dumbbells, a machine with a chest plate or standing to relieve pressure off the low back as outlined in the green light chapter. You get one back so you must take care of it. When in doubt, don't.

SHOULDERS

DUMBBELL SHRUGS (shoulders--trapezius)

Figure 5.15 Dumbbell shrugs starting position

Starting Position (figure 5.15): Stand with feet shoulder width part and dumbbells hanging at sides with palms turned in. Keep your spine and neck straight even though your shoulders are depressed in a downward direction.

Midpoint (figure 5.16): Simultaneously, shrug the top of each shoulder towards your ears. Pause for a second at the top and slowly lower back to the starting position. Keep your spine straight throughout the movement and avoid hunching your upper back and neck.

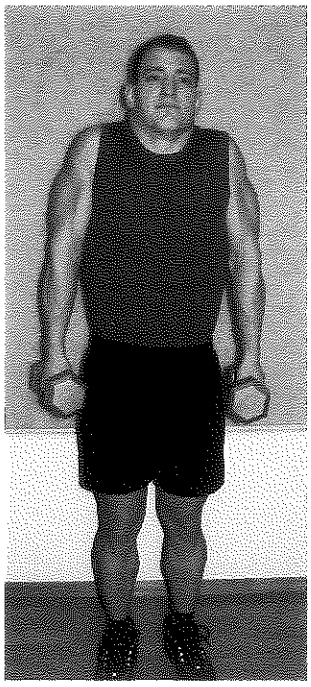


Figure 5.16 Dumbbell shrugs midpoint

Rationale: *This exercise is not for anyone who has degenerative disc disease of the cervical spine or neck pain.* The problem is that the upper trapezius muscle inserts at the base of the skull and then descends to the spinous processes of cervical vertebrae C-7 to T-12 (as well as the scapulae and tip of the clavicle). So when the upper trapezius contracts to perform a shrug it places compression on the cervical discs. If the openings where your cervical nerve roots exit (intervertebral foramen) are already narrowed from bulging and or narrowed degenerating discs then extra compression from shoulder shrugs could be just what you need to give you some neck or radiating arm pain.

With all that said, I should mention that I do perform light shrugs and often give them to patients without weight or minimal weight. Practically speaking, you can try shrugs and slowly increase your weight. If it begins to make your neck sore ease back on the weight a little. Do not use too much weight though as heavy shrugs will compress your neck—moderation certainly applies here. I do not recommend using a barbell for shrugs either because it is just too easy to use way too much weight.

DUMBBELL SIDE/LATERAL RAISES (shoulders--Rotator Cuff/Supraspinatus and Lateral Deltoid)

Figure 5.17 Dumbbell side raises starting position

Starting Position (figure 5.17): Stand or sit on a bench holding a dumbbell in each hand with your thumbs up. Your elbows should be bent to about a 90 degree angle or slightly more extended but not completely straight. This bent elbow position shortens the lever arm acting on the rotator cuff. This exercise is for intermediate and advanced lifters.

Midpoint (figure 5.18): Raise the dumbbells out to the side keeping your trunk straight. A slight forward lean is OK but do not bend backwards. Raise the dumbbells to where your arm and elbows are slightly *below shoulder level*. This is extremely important to prevent a shoulder injury. *DO NOT raise your elbows above shoulder level.* This exercise can also be performed in the place of "scaption" which is about 30 degrees forward from the plane of the body if painful.

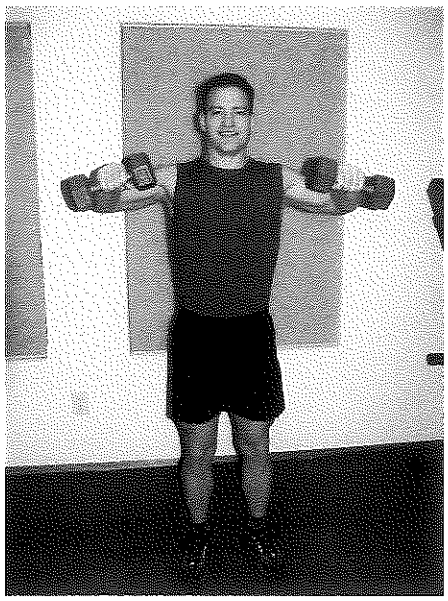


Figure 5.18 Dumbbell side raises midpoint

Note: See next page for tips on dumbbell side raises.

DUMBBELL SIDE/LATERAL RAISES CONTINUED… (shoulders)

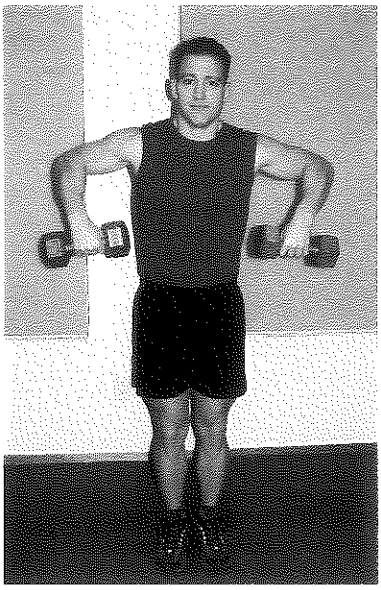


Figure 5.19 Tip for dumbbell side raises—do not let forearms tip down (internally rotate).

Tip (figure 5.19): Your elbows should not move during the exercise and your hand/forearms should not tip down (internally rotate)—see picture at left.

Tip (figure 5.20): Do not allow your elbows and arms to go above shoulder height as it will damage your shoulders—above shoulder height is the "impingement zone."

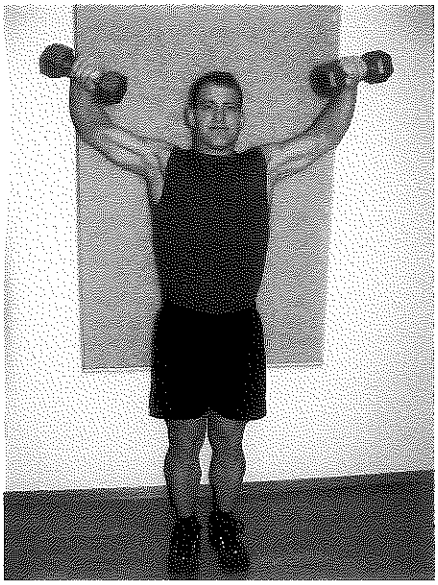


Figure 5.20 Tip for dumbbell side raises—do not lift elbows above shoulder level!

Rationale: This exercise is one of the last exercises that I will add to a shoulder routine as it has great potential to cause shoulder impingement and pain. A good rule of thumb is that you should be able to perform all the green light exercises without pain before adding this exercise to your shoulder routine. In other words, *build a base of shoulder girdle strength first before attempting this exercise.*

Anatomically speaking, the reason this exercise can cause problems is that it places a lot of leverage on the rotator cuff. As stated previously, the further your elbows/arms move away from your body (abduct) laterally, the more force it places on your shoulders. Another reason this exercise can cause pain is that at the top of each repetition, your shoulders come very close to the impingement zone beginning at around 70-90 degrees of elevation. Therefore, it is paramount to *keep your elbows lower than shoulder level to avoid shoulder injury or inflammation.* If your shoulders are painful, hold off on this exercise until all or most of the pain has resolved. I do perform this exercise on a regular basis but am extremely careful not to use too much weight and am sure to use proper form. This exercise can also be performed with a band or cable system for variety.

DUMBBELL SHOULDER PRESS—IN FRONT OF NECK (shoulders)

This exercise, along with behind the neck or standard dumbbell shoulder presses (red light exercises) is my least favorite exercise as it has a high propensity to cause shoulder injury such as a rotator cuff tear. I would much prefer that you perform any other shoulder exercise than this one. With that said we will now demonstrate proper form with this exercise. Never go heavy with this exercise. You should be able to perform at least 10-12+ repetitions in proper form or the weight is too heavy and you are setting yourself up for injury.

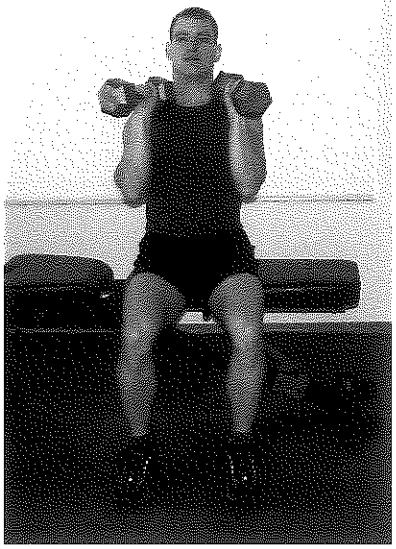


Figure 5.21 Dumbbell shoulder press starting position

Starting Position (figure 5.21): Sit on the end of a flat bench press with the backrest tilted back from the vertical plane about 15 degrees (or sit on a flat bench). Feet should be planted on the floor and dumbbells should rest near the front of each shoulder or the front of the deltoid muscle.

Midpoint (figure 5.22): Exhale as you press the dumbbells overhead to a position where your elbows are straight. Your palms should be facing forward slightly and as you press overhead your palms will rotate straight forward so that they are parallel with the horizontal plane. Pause for a second at the top and then slowly return to the starting position. Lines drawn for emphasis to show impingement zone above 90 degrees elevation.

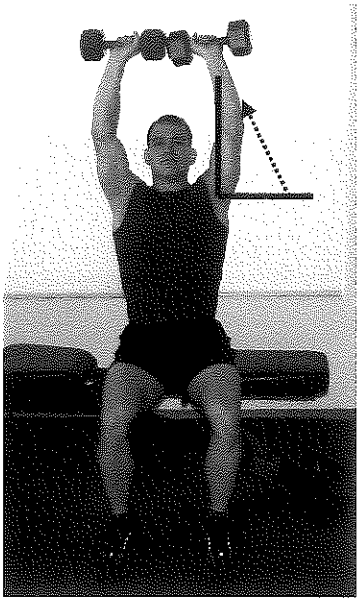


Figure 5.22 Dumbbell shoulder press midpoint

Rationale: Patients have come into our clinic with impingement and rotator cuff tears, requiring treatment, from performing this exercise before seeking medical care. Furthermore, I performed this exercise up until a few years ago when I sustained a small

rotator cuff tear performing this exercise. Needless to say my shoulder has not been the same since. I thought that being a physical therapist that if I used really strict form and progressed my weights slowly that I wouldn't get hurt. Well, I was wrong. Granted, I was able to perform this exercise for years without injury but at the age of 34 it finally caught up with me. In retrospect I may have been training a little heavy for this exercise, in the 8 repetition range, but my form was strict—still I got hurt and after a few years my shoulder still isn't quite the same. Do I recommend this exercise to patients or still do it myself? No. However, if you do not have shoulder pain and keep the weight light so that you can perform 12+ repetitions, you possibly can perform this exercise without shoulder injury. It was tempting to place this exercise in the red light category but it is common enough that I do not want to be accused of being overly cautious. In summary, it is not recommended that you perform this exercise if you have a history of shoulder injury or surgery. It might serve you best if you avoid this exercise altogether even if your shoulders are healthy. If you do perform it please use caution. Please also keep in mind that behind the neck shoulder presses are completely out of the question—see chapter 6 on red light exercises.

BICEPS

INCLINE DUMBBELL CURLS (biceps)

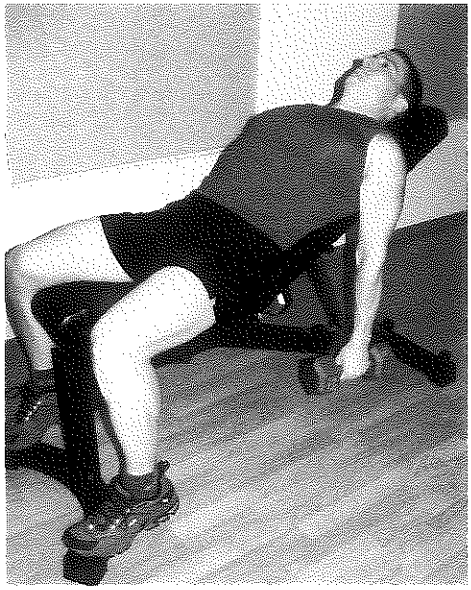


Figure 5.23 Incline dumbbell curls starting position

Starting Position (figure 5.23): Lie back on a bench press incline 30-45 degrees from the horizontal. Your feet should be firmly planted about shoulder width on the floor. Elbows should be almost straight with palms facing towards the body in a neutral position.

Midpoint (figure 5.24): Exhale as you bend your elbow and curl the weight towards your shoulder as you rotate your palm/dumbbell to a palm facing forward position. Pause for a second at the top while you squeeze your biceps and then slowly lower. No bouncing or jerking during the movement.

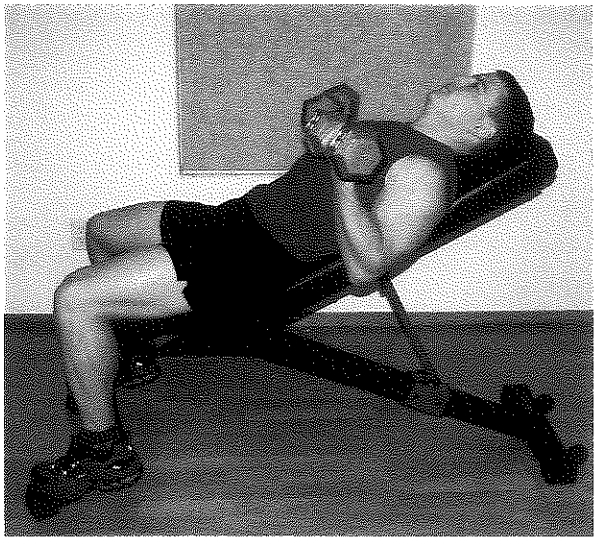


Figure 5.24 Incline dumbbell curls midpoint

Note: See next page for important note on incline dumbbell curls.

INCLINE DUMBBELL CURLS CONTINUED... (biceps)

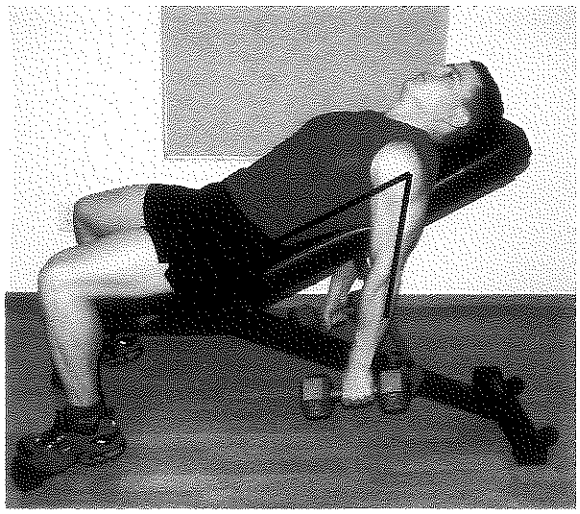


Figure 5.25 Tip for incline dumbbell curls—this exercise places the shoulder in an awkward position of extreme extension far past the plane of the body.

Tip (figure 5.25): This exercise tends to overstretch the front of the shoulder and places excessive stress on the biceps insertion. Lines drawn to show how far the shoulder is extended beyond the plane of the body (about 45 degrees). When your shoulders go beyond the plane of the body (especially greater than 15-20 degrees) bad things tend to happen!

Rationale: This exercise has a tendency to overstretch the front of the shoulder as it is placed near end-range extension. The biceps tendon at the front of the shoulder is also placed in an awkward angle of pull. Since the tendon of the long head of the biceps is a commonly torn tendon (just ask your local orthopedist) where it inserts into the capsule of the shoulder. I see no need to place undue stress on this attachment especially since there are so many safe green light exercises to choose from—I quite performing this exercise years ago. With light weights this exercise is probably OK so it makes the yellow light category, as opposed to red, but there are certainly less injury prone bicep exercises to perform. As always with a yellow light exercise—exercise caution.

BARBELL CURLS (biceps)

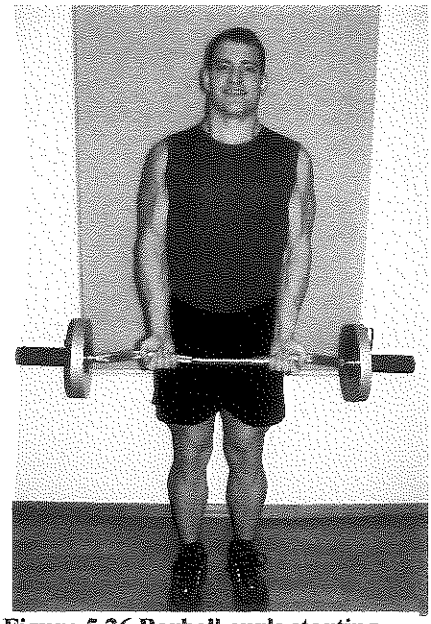


Figure 5.26 Barbell curls starting position

Starting Position (figure 5.26): Stand holding curl bar as shown with palms facing forward. Using a curl bar will help to ease some of the stress on your elbows and wrist. Keep back straight and shoulders back—not hunched forward. It helps to keep your elbows slightly flexed at the bottom of the movement to relieve pressure off the elbows.

Midpoint (figure 5.27): Exhale as you bend elbows and lift the bar while squeezing your biceps. Pause at the top for a second being sure to keep your biceps tight, and then slowly lower to the starting position.

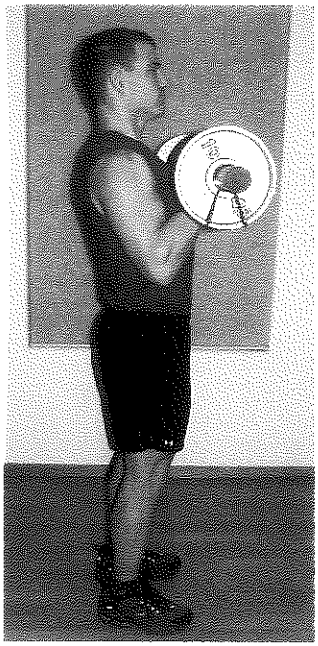


Figure 5.27 Barbell curls midpoint

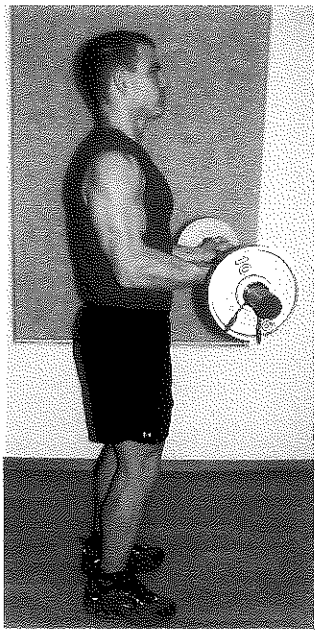


Figure 5.28 Tip for barbell curls—this is where maximum leverage occurs on low back

Rationale: This exercise gets the yellow category because the back has quite a bit of leverage on it when your elbows are bend at 90 degrees (see figure 5.28), although at the start and finish of the exercise the leverage is minimal. If your back isn't sore you likely will not even notice it. However, if your back has been injured or you have had surgery you will be aware of it. If any of these conditions exist, opt for bicep exercises where the weight is supported for you (i.e. green light preacher bench curls or standing dumbbell curls etc.). Although dumbbell curls use a similar motion, the dumbbells can be performed one a time cutting the leverage on your low back in the midrange in half. Dumbbells can also be curled very close to the body unlike a barbell.

Tip (figure 5.28): Do not lean back or swing as you curl the bar.

TRICEPS

CLOSE-GRIP BENCH PRESS (triceps)

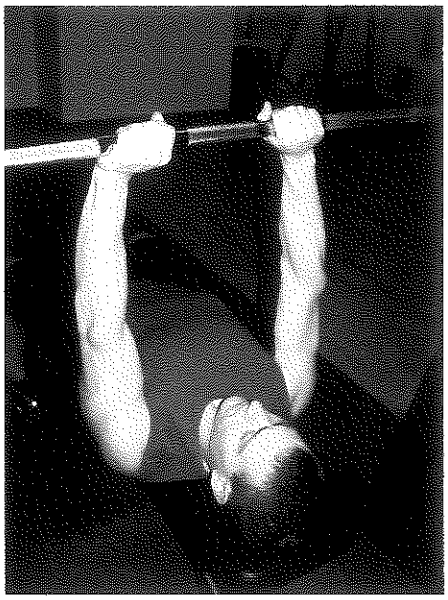


Figure 5.29 Close-grip bench press starting position

Starting Position (figure 5.29): Lie on your back on a flat bench press grasping a bar as shown with your hands about 4 to 8 inches apart—narrower than shoulder width. Press the bar overhead being careful to keep your elbows near your sides until your elbows are straight.

Midpoint (figure 5.30): Inhale as you slowly lower the bar towards your lower chest. Keep your elbows near your sides. Pause for a moment when the bar reaches your chest and then return to the starting position.

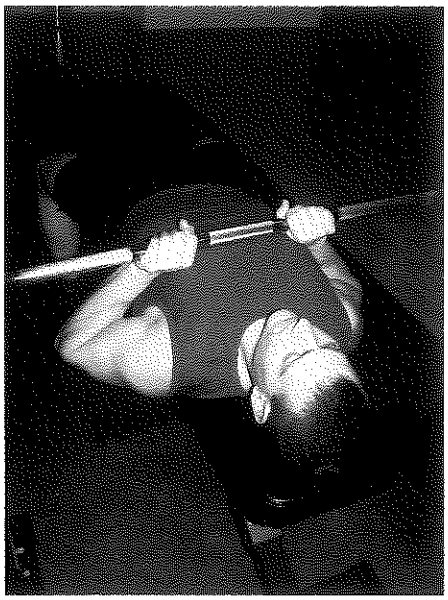


Figure 5.30 Close-grip bench press midpoint

Rationale: Although you will likely never seriously injure your shoulder with this exercise, you can strain your shoulders or make your elbows sore. This exercise places your shoulders and elbows in an awkward position at the beginning of the movement. It also has a tendency to make the elbows sore because they are bent greater than 90 degrees (hyper-flexed). With so many superior green light exercises to work your triceps, I see no need to perform an inferior tricep exercise. Hence, the yellow light designation—the benefits here do not seem great enough to outweigh the risks in light of other choices.

DIPS (triceps)

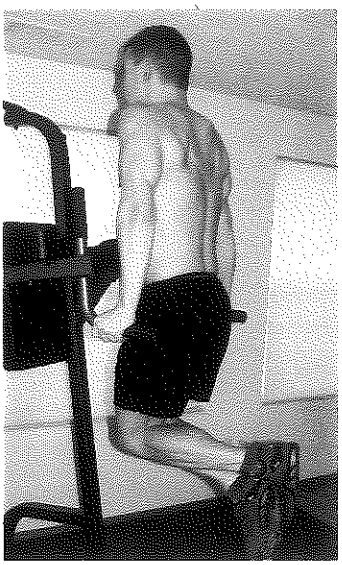


Figure 5.31 Dips starting position

Starting Position (figure 5.31): Find a dip station and grasp the parallel bars and push yourself upwards until elbows are straight. *Keep your elbows close to your sides* to reduce the pressure on your shoulders. To keep from swinging it is helpful to bend your knees and hook one leg over the other.

Midpoint (figure 5.32): Inhale as you slowly lower your body, keeping elbows and arms near sides, until your elbows are bent to about a 90 degree angle (your shoulders should be above your elbows). If this position hurts your shoulders try not going as low, say to 50-60 degrees of elbow bend (flexion). If dips hurt even when modified, move back to the green light category for exercising your triceps.

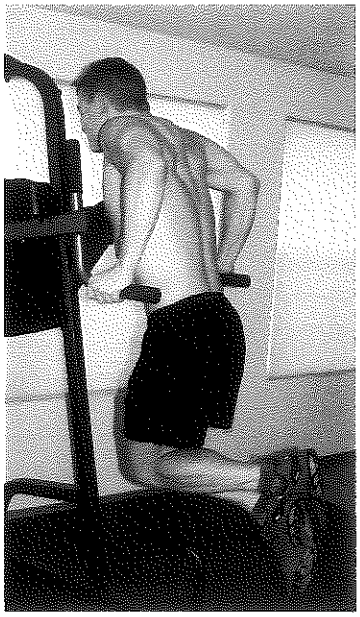


Figure 5.32 Dips midpoint

Figure 5.33 Tip for dips—do not go too low.

Tip: DO NOT go too low with this movement or you can hurt your shoulders. Your elbows should not bend more than 90 degrees, unless you want to make your elbows or shoulders painful.

Rationale: This is an incredible exercise for the triceps but *should only be performed by advanced lifters who can easily support their body weight with their arms.* Do not perform this movement if it causes pain. Note: Beginning and intermediate lifters can work up to this exercise using a dip machine so that it can be performed with less than their bodyweight.

OVERHEAD TRICEP DUMBBELL EXTENSIONS (triceps):

Figure 5.34 Overhead dumbbell tricep extensions starting position

Starting Position (figure 5.34): Stand with your feet about shoulder width apart hold a dumbbell overhead as shown. Your elbow should be straight but your knees slightly bent.

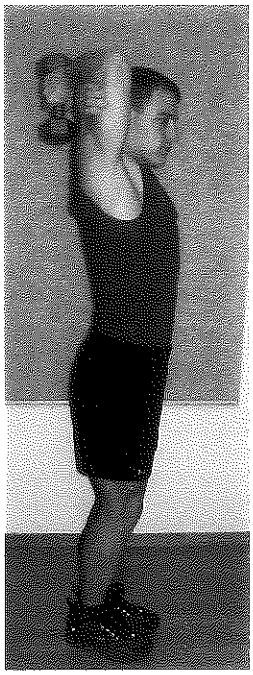


Figure 5.35 Overhead dumbbell tricep extensions midpoint

Midpoint (figure 5.35): Slowly lower the weight as you inhale to a position where your elbows are bent to about 90 degrees. Be careful not to hyper-flex your elbows as it will make them sore later. Exhale as you return to the starting position.

Tip (figure 5.36): Do not allow your elbow to bend past 90 degrees as it will make your elbow sore later.

Note: This exercise can also be performed with both hands grasping one dumbbell.

Figure 5.36 Tip for overhead dumbbell tricep extensions

Rationale: This exercise was placed in the yellow light category as the shoulders are placed in an unstable position to work the extremely strong triceps. I find that my shoulders fatigue before my triceps do in this position. I doubt you will ever be seriously hurt with this exercise but it can make your shoulders sore as they are held far into the impingement zone—the greater tuberosity of the humerus is basically jammed against the coraco-acromial shelf. Again, with so many other good exercises to pick from why perform this exercise?

THIGHS (Quads)

SQUATS (thighs/quads)

Before we go any further with describing the squat exercise realize that this is only for intermediate to advanced lifters. Furthermore, realize that I would rather you perform leg press or another exercise that will not compress your spine—*see rational section.* This exercise was close to the red light section and some would argue to never perform it. For now we will say to never squat above your body weight to avoid accelerating the wear and tear on your spinal discs. *If you have a history of back pain or injury you would be wise to avoid this exercise completely.* There are many other green light choices to build your quads that will not cause premature wear and tear on your back.

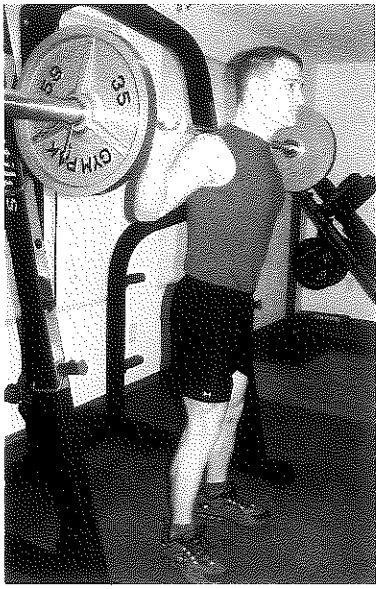


Figure 5.37 Squat starting position—side view

Starting Position (figure 5.37): Stand with feet about shoulder width apart slightly toed out. Place a barbell on the upper region of your upper back just above your shoulder blades. Do not rest the bar on your neck. Be sure to keep your *back straight with and inward curve* (lordosis) in your low back and abdominals tight.

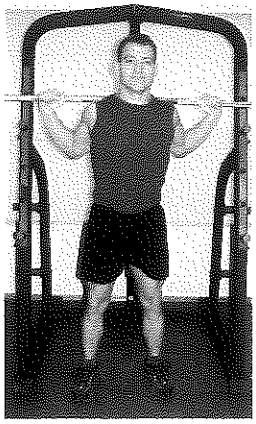


Figure 5.38 Squat starting position—front view

Starting Position (**figure 5.38**--front view): Here is a picture of the starting position from the front so that proper foot placement can be viewed.

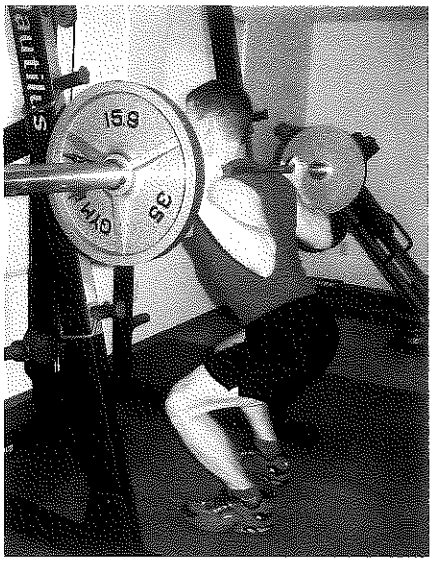


Figure 5.39 Squat midpoint

Midpoint (figure 5.39): Inhale deeply as you slowly lower the weight until your knees are at about a 90 degree angle. Maintain the inward curve in your low back and keep your chest lifted. Pause briefly and then reverse directions as you press upwards and exhale.

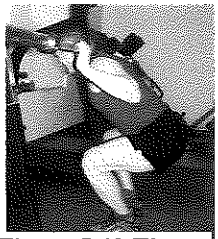


Figure 5.40 Tip for Squat—do not bend forward!

Tip (figure 5.40): DO NOT bend knees greater than 90 degrees or forward flex at the bottom.

Rationale: ***Any weight that you place on your shoulders will load your spinal column and vertebral discs—potentially increasing joint wear and tear.*** It is no wonder that so many people injure their backs performing barbell squats. The load on your discs is incredible and it can lead to a herniated disc. Because 80% of us will suffer from back pain at one time or another during our lifetime I urge you to think twice before performing heavy squats. Bear in mind that the spine you have must last a lifetime. The chief complaint of many older patients that I see, even if the rest of them is in excellent condition, is pain from degenerative disc disease (aka "spine arthritis"). Our spine starts to show some early minor degenerative changes in or 30's so by the time we are 70, 80 and 90+ years of age the wear and tear is significant. I see no need to increase this natural process with heavy squats.

Be aware that your spine will not hurt until damage has occurred. This is because your spinal discs are not innervated until you get to the outer edge of the disc. So your disc can have some wear and tear and be pain free. The pain won't really start until you have an actual bulge and it is placing pressure on the outer ring of the disc (annulus fibrosus) or a spinal nerve root. Not to panic as the jelly-like material inside the disc (nucleus pulposus) can retract slightly, and the outer wall of the disc can scar over and heal to a certain degree. However, if the bulge is too big you might need to see a neurosurgeon. Not a trip any of us want to make!

The knees not being bent greater than 90 degrees is to prevent excessive strain on the back and knees. Once the knees are bent greater than 90 degrees it is extremely hard to prevent your upper body from leaning forward, thus placing extreme stress on your low back. In fact, the first time I ever injured my back at the age of 25 it was while performing deep and heavy squats. It really surprised me because I had been squatting since the age of 14 and by the age of 25 my form was excellent. Perhaps the underlying point here is that *you may get away with these for a while but they will eventually bite you*!

HACK SQUAT MACHINE (thighs/quads)

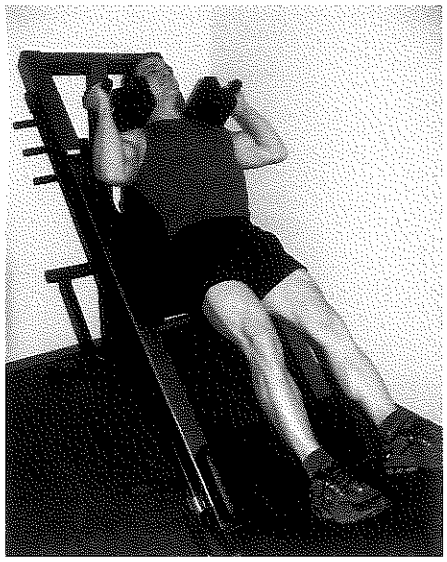


Figure 5.41 Hack squat machine starting position

Starting Position (figure 5.41): Stand under a hack squat machine with your shoulders under the pads. Most importantly, keep your back flat and straight against the backrest. Your feet should be about shoulder width apart and stepped out in front of you (away from the plane of the body) about 6 to 8 inches—this reduces the shear forces on your knees. Try to look straight forward and keep your neck straight.

Midpoint (figure 5.42): Inhale deeply as you slowly lower the weight until your knees are at a 90 degree angle. (If your knees are painful in this range do not go this low.) Pause for a second and then exhale as you squeeze with your thighs and hips.

Figure 5.42 Hack squat midpoint

Rationale: Same rationale as for squats. *Not recommended for people with back problems.* Even if your back is healthy it is not recommended that you hack squat above your body weight to preserve your spine. This exercise can also be performed with a Smith Machine.

CALVES

STANDING CALF RAISE MACHINE (CALVES)

I would prefer that you use your body weight to work your calves, leg press machine or even a seated calf machine so you do not compress your spine. This exercise gets the yellow light designation due to the compresses forces imparted to the spine by the shoulders.

Starting Position: Stand so the balls of your feet are on the platform and the shoulder pads are on your shoulders. Your feet should be about shoulder width apart and your back straight.

Movement Phase: While keeping your knees straight, inhale as you slowly lower the weight to a position of stretch on your Achilles tendon and calf. Pause for a moment and then exhale as you rise to a tip toe position. Squeeze your calves like crazy at the top while you hold for a moment and then lower in a controlled fashion to the starting position.

Rationale: Same rational as for squats except not quite as bad because your back is kept straight through entire movement and knees are not involved. If you keep your form strict and use light weight this exercise is fairly safe. However, once again if you have a history of back pain you are better off avoiding this exercise completely since there are other effective green light exercises that will get the job done.

CHAPTER 6: RED LIGHT EXERCISES—These exercises often result in injury and are best avoided by the average lifter.

The following exercises have been shown to cause injury even when proper form is observed. Actually, the idea for this book was generated from seeing patients get hurt again and again by doing these inferior exercises. These exercises place you at risk for injury because they use *extremely* long lever arms to place stress on the muscles and/or put compressive and/or shear forces on the joints involved. These factors combined make these exercises pure losers for the general public who wants to exercise without getting hurt.

Keep in mind that when you consider all the many exercises covered in this book very few have actually made my "black list" (or actually red in this case). I am a big proponent of weight training but some exercises have such a high propensity to cause injury that the benefits simply do not outweigh the "wear and tear" that they cause on the body. To summarize, *red light exercises are not worth performing because the benefits do not outweigh the risks.*

Also bear in mind that I am far from an alarmist when it comes to exercise. Exercise will keep you healthy and feeling good for years to come but it must be done intelligently and with caution. Weight training is a relatively new science and my belief is that *JUST BECAUSE AN EXERCISE IS POSSIBLE DOES NOT MEAN THAT IT IS ALWAYS BENEFICIAL.* This book is meant to be a step in the direction which helps you sort out the useful from the potentially harmful.

Most of the exercises highlighted in this section involve the shoulders, low back and knees. These are, without a doubt, the most susceptible regions of the body for injury. In the physical therapy clinic where I work, these are the areas that I see people injuring every day. As we all age, these areas tend to have the highest "wear and tear" factor giving people pain and suffering in their later years. Therefore, it makes good sense to exercise smart and safe to avoid placing excessive strain or wear on these areas through damaging exercise movements. Pictures will be shown of these *exercises not so that you try to perform them but merely so that you know which ones to avoid.* Proper form will not be covered with these exercises as I do not encourage their use even with proper form. Instead, in this section time will be spent detailing why these exercises should be avoided through biomechanical analysis and as before the rational will be given. If these were the only exercises there were to perform I could see trying to make the best of these by decreasing the weight, limiting the range of motion etc., but with so many safe exercises these just do not make sense for the average lifter.

The goal of exercise is to make you stronger, help you feel more vital and energetic, and keep you healthy for work, play and daily activities. Exercise should not give you painful shoulders, knees or a low back. Injuries in these key joints will short circuit your fitness goals. Follow these guidelines and you truly will be able to "Lift Through Life."

CHEST

No red light exercises—see yellow light chapter.

SHOULDERS

UPRIGHT ROWS (SHOULDERS)—A great way to inflame your shoulders through impingement!

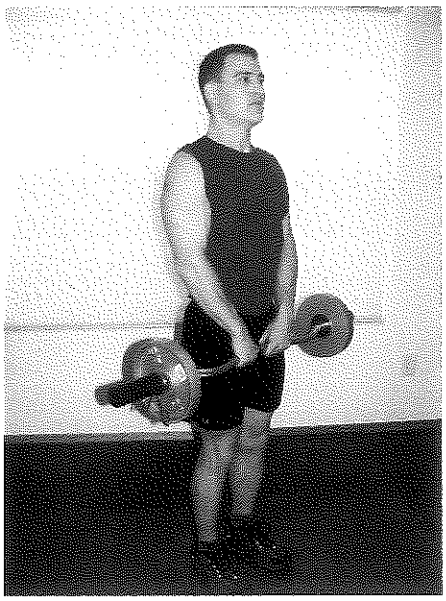


Figure 6.0 Upright rows starting position

Starting Position (figure 6.0): Nothing bad happening here but just wait until you get to the top of the movement. This exercise will work your muscles but at the expense of your shoulder rotator cuff tendons. DO NOT do it. *Remember, even if it does not hurt at the time it can be causing damage and the pain often does not show up until later.*

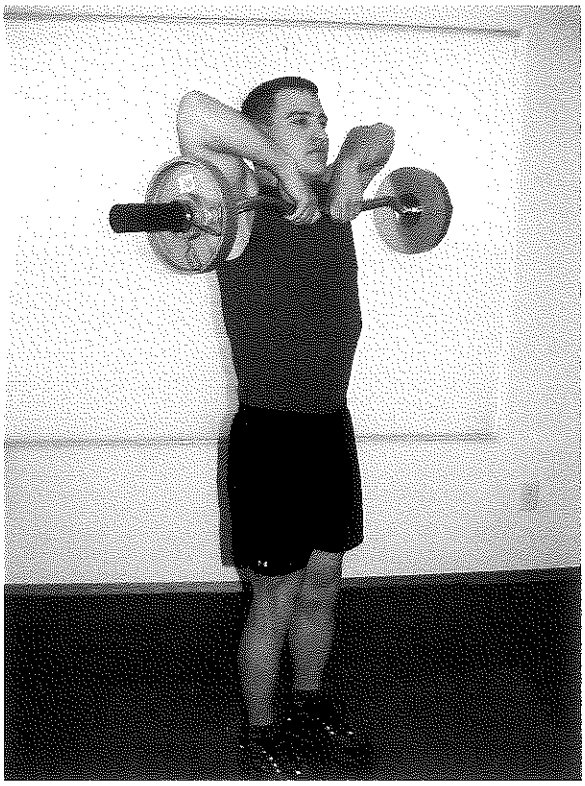


Figure 6.1 Upright rows midpoint

Midpoint (figure 6.1): *This is position is where your shoulders will complain due to impingement or "pinching" of the shoulder bursa and/or rotator cuff tendons.*

Rationale: Upright rows place the shoulder in a awkward position of forward flexion, slight abduction and if that were not bad enough it adds internal rotation which rotates the greater tuberosity of the humerus under the sub-acromial shelf. This movement (internal rotation and elevation) has been shown in cadaver studies to pinch the biceps tendon, supraspinatus tendon (rotator cuff tendon) as well as the sub-acromial bursa.[1]

You may find it interesting that this is the position that medical doctors and physical therapists alike use to test patients for possible impingement syndrome of the shoulder—a painful condition involving inflammation and pain with reaching, especially at and above shoulder level. This test is called the Hawkins-Kennedy Impingement Test.[2-3] In this test

the shoulder is flexed to roughly 90 degrees and then internally rotated to end-range (see figure 6.3). Do you see the similarity between the test and this exercise? The funny part is that I did upright rows for years and never really understood why they made my shoulders sore until I got through physical therapy school and then the anatomy combined with the physics made it all clear. I wish someone had told me sooner. I hope that you can benefit from my mistakes. One day it will be common knowledge that this exercise is bad for your shoulders—help me get the word out!

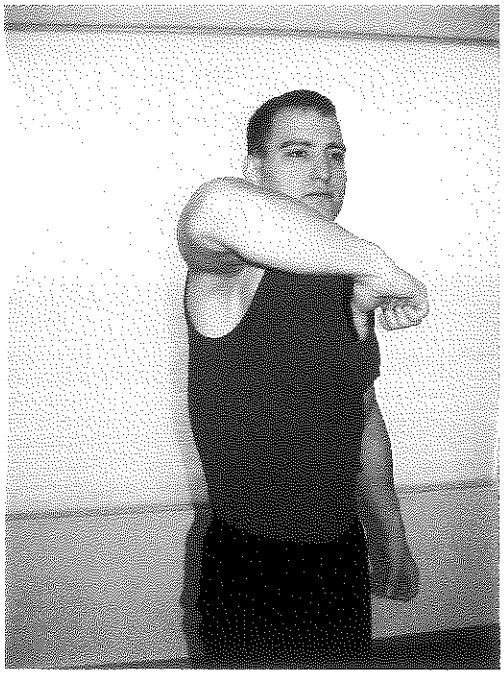


Figure 6.2 Hawkins-Kennedy Impingement Test

BEHIND THE NECK BARBELL PRESS AND DUMBELL PRESSES (shoulders) (There are multiple problems with this exercise… where do I start?) This exercise is being demonstrated with a barbell but it is not much better with dumbbells out to the sides over your shoulders.

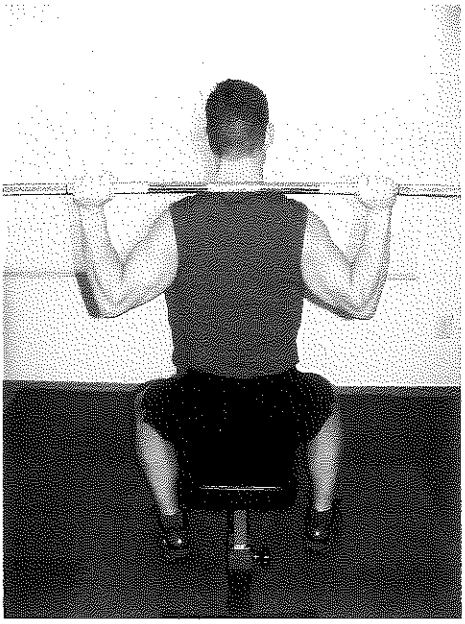


Figure 6.3 Behind the neck barbell press starting position

Starting Position (figure 6.3): This exercise starts out bad as your shoulders are placed in an unstable position of abduction and extreme external rotation in a position close to what is called the "dislocation position." If your shoulder has a tendency towards being unstable this position is what can cause them to dislocate in a forward direction. Even if your shoulders are stable why place your muscles in a awkward and injury prone position from which to press with other options available?

Do this exercise and your shoulders will eventually get hurt!

Midpoint (figure 6.4): If the starting position were not bad enough it gets worse… To perform the exercise you must press directly through the impingement zone and then reach an end point overhead where again the shoulder is placed in an unstable and vulnerable position for your rotator cuff.

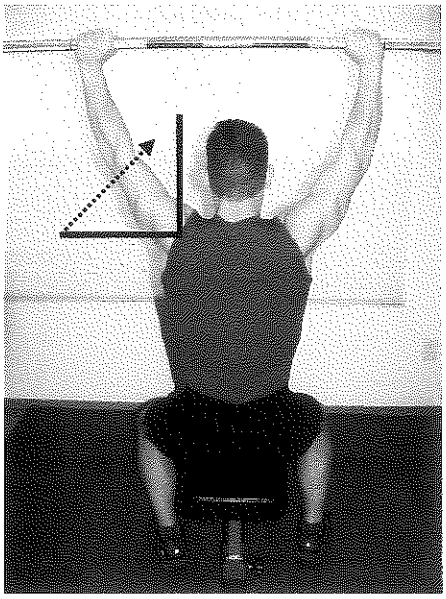


Figure 6.4 Behind the neck barbell press midpoint—pressing through impingement zone. Ouch!

Rationale: Much of the rationale was covered above put stated simply your shoulders are placed in an injury prone position throughout the entire exercise from start to finish. Do not get me wrong, *shoulders are designed to reach overhead occasionally. However, if you do it repeatedly for exercise and then add a heavy weight you are begging for trouble*! Again, keep in mind that the impingement zone is above 90 degrees shoulder elevation—see picture. Does it make sense to perform an exercise that actually makes you workout in that exact same zone? Not a bit. I should also mention that impingement mainly seems to occur with pressing overhead and not pulling. So although some exercises seem similar (i.e. lat pull-downs in *front* of the head) they are actually quite different in the mechanics of the motion.

EMPTY-CAN EXERCISE IN ABDUCTION OR SCAPTION (aching rotator cuff—supraspinatus)

Figure 6.5 Empty-can exercise starting position

Starting Position (figure 6.5): Thumbs are pointed in a downward or pronated direction thereby rotating shoulder into a position ready for impingement as elevation occurs.

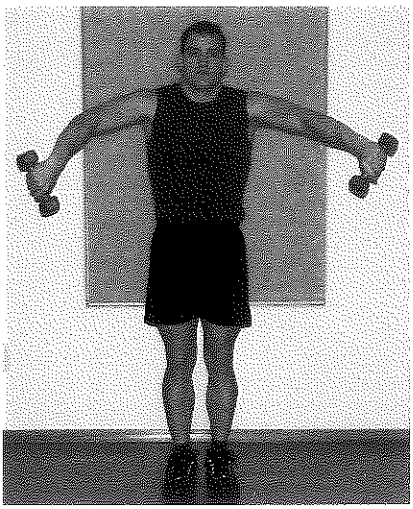


Figure 6.6 Empty-can exercise midpoint—perfect position for impingent to occur.

Midpoint (figure 6.6): The arms are moved out laterally from the body in the place of "scaption" (30 degrees from the plane of the body) with the thumbs down and internally rotated. As you can tell from the look on my face this is an uncomfortable position.

Rationale: This exercise is

damaging for the same reason that military press and upright rows is damaging. It takes your shoulders right to the impingement zone with each repetition except it is actually even worse because the shoulder is internally rotated throughout the movement which again rotates the greater tuberosity of the humerus directly underneath the sub-acromial shelf—a perfect position to pinch and irritate the rotator cuff tendons. *It is not advisable to perform this exercise given new research.*[4]

The empty-can exercise gained popularity when EMG studies showed that electrical activity was extremely high with the shoulders performed this movement. However, what we failed to realize was the impingement that was occurring at the top of the movement. Recent studies have moved away from the empty-can method in favor of the neutral (thumbs facing up) or "full-can" method (thumbs facing up and out—externally rotated) as shown in the green light portion of this text with dumbbells.[4-5]

BEHIND THE NECK LAT PULL-DOWNS (back)

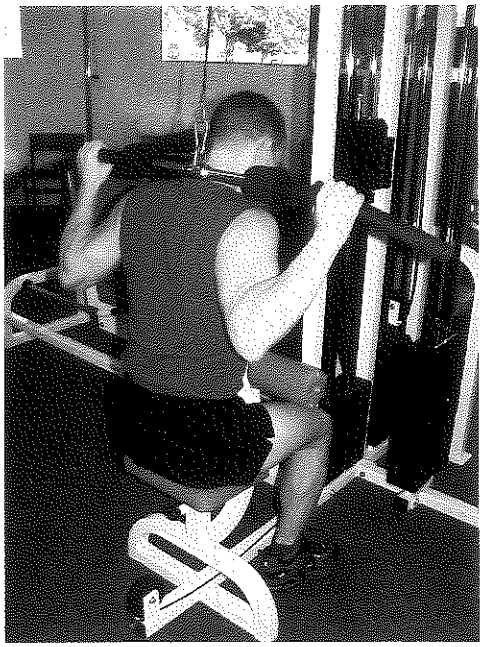


Figure 6.7 Behind the neck lat pull-downs—this is an injury prone position for the neck and shoulders.

This exercise is not recommended because it can injure your shoulders or neck. The shoulders are in a vulnerable position[6] and the neck is forced to jut forward **(figure 6.7)**.

Rationale: The main problem with this exercise is with the behind the neck position for the same reasons that it was bad with military press—your shoulder is forced into an awkward and unstable position. This exercise also places your neck in an injury prone position of forward flexion so that the bar can be pulled behind your neck. This places your neck discs under increased pressure and therefore increased risk for injury. Anytime, with exercise or work that you move your spine from being straight, where you are maintaining proper spinal curves, to a position where your spine is either hyper-extended or forward flexed under load, then an injury will eventually occur—it is a matter of physics.

Some might defend this exercise by saying that you must perform this movement in front and behind the head/neck to balance the upper back muscles. The problem with that line of thought is that it is not true. It actually shows a lack of understanding of anatomy and muscle function. This exercise mainly works the latissimus dorsi (lats) muscle and the teres major although the lower fibers of the trapezius muscle also participate. To pull the bar down in front OR behind the neck these same muscles are activated. The lats, teres major and lower trapezius work together to create downward rotation, depression and retraction of the scapulae whether the bar is in front or behind the neck. However, your

shoulders and neck sure know the difference! The key here is to work the target muscles without getting hurt so keep them in front of the neck.

BACK & HAMSTRINGS

I can hardly believe that these exercises are still recommended. With the knowledge that we have today regarding physics as it applies to the body (biomechanics) there is simply no way people should be doing these exercises. These lifts will not only injure your back but could actually cause premature wear and tear on your spine by increasing the pressure on the disc during the exercise. ***It is well documented that forward bending at the waist, especially when lifting a weight, increases disc pressure by more than 100% as compared to the upright standing position.***[7-10] Please do not misunderstand me as I am not talking down to anyone. I have made plenty of mistakes and have performed all of the exercises to follow until I knew better. It is time that modern science and medical care merge to prevent injury with during exercise and weight training—here we go.

Since these exercises are basically variations of the same bad position—being bent forward at the waist. The rational for all will be covered after all the pictures are shown of the exercises. *Anytime you bend forward it markedly increases the pressure on your spinal discs, even when your back is straight, no argument.*[7-10] *Why perform an exercise where you are purposefully injuring your discs?* This has been confirmed with actual pressure gauges that have been inserted into the discs. Furthermore, most back injuries occur with a component of forward flexion. Haven't you experienced this yourself? Read on…

The following exercises all utilize a forward-flexed position of your lumbar spine which over time will cause early wear and tear not to even mention pain. For this reason the following exercises have been included together to avoid repetition.

- Good Mornings (aching back)
- T-Bar Rows--non-supported chest (aching back)
- Bent Over Dumbbell or Barbell Rowing--non-supported (aching back)
- Bent Over Dumbbell Reverse Flys (aching back)
- Straight-legged deadlight (hamstrings but also aching back)

The pictures speak for themselves but a rational will be given after all the exercises have been shown. When looking at these pictures ask yourself if you would pick up a bag of cement off the ground and then stay bent over while you pulled up and down on it. Most people would recognize that is not proper body mechanics. So it is with these exercises; you are forced into a poor posture just to perform the exercise. Life has enough awkard and unforgiving postures that place wear and tear on your spines. There is no need to add to it by seeking out inferior exercises.

"GOOD MORNINGS"--These will give you a bad morning all day! (aching back)
No matter how you do it, with dumbbells or a barbell, these are still bad.

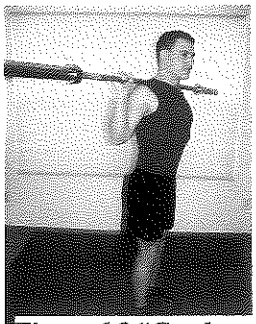


Figure 6.8 "Good morning" starting position

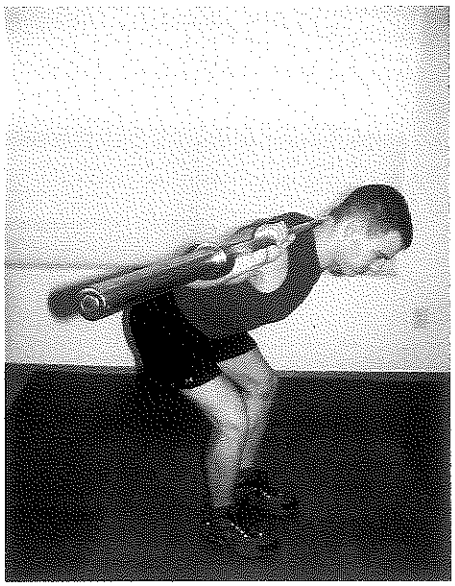


Figure 6.9 "Good morning" midpoint—a good way to injure your low back!

Midpoint (figure 6.9): Although the person who thought of this had good intentions of building the lumbar spine, hip and hamstring muscles, this exercise will ruin your back! Right now there is a ton of pressure on my lumbar spine. Herniated disc here we come! The scary part is that people with low back injury sometimes perform this to strengthen their back while unknowingly inducing further injury.

BENT OVER T-BAR ROWS--non-supported by chest support (aching back)

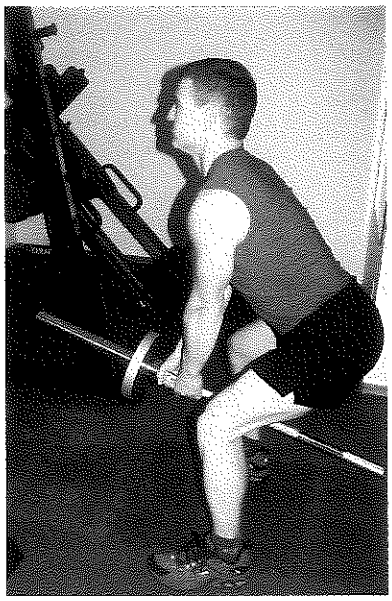


Figure 6.10 Bent over T-bar rows starting position

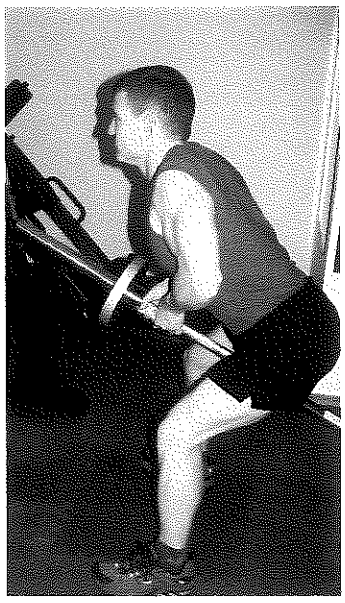


Figure 6.11 Bent over T-bar rows midpoint

Midpoint (figure 6.11): Still too much pressure on the lumbar spine. Not as bad as good mornings but a close second. There are much better exercises for working your upper back without the same risk of lower back injury.

Note: I am using a barbell but the T-Bar row machine is the same position for the low back.

BENT OVER DUMBBELL OR BARBELL ROWING (aching back)

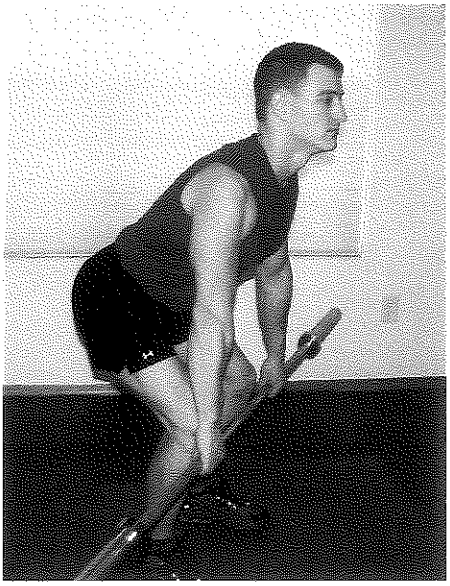


Figure 6.12 Bent over barbell rowing starting position

Starting Position (6.12): As you can already see this is not a great position in which to exercise your back. *Right now all the pressure is on my L-4/5 and L-5/S-1 discs.* It is the connecting point for my trunk and pelvis and right now it is bearing all the pressure of my upper body plus the weight of the barbell. Disc pressure is rising up to and possibly greater than 100% as compared to what it would be if I were in the standing position.[7-8]

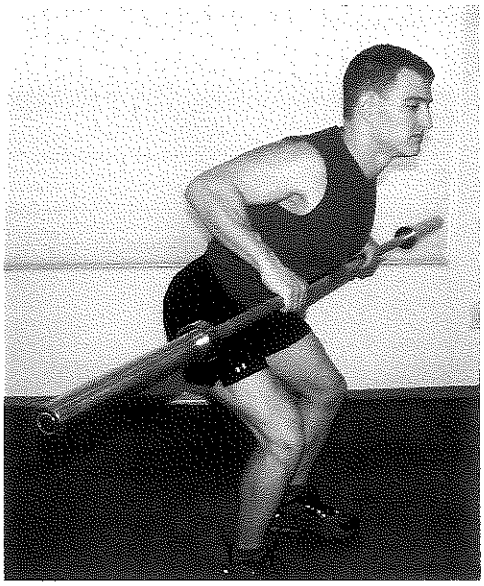


Figure 6.13 Bent over barbell rowing midpoint—a sure way to make your back sore!

Midpoint (figure 6.13): Unfortunately, you get to stay bend over for the duration of the exercise so the pressure is never relieved off your low back even for a moment.

Note: I do not argue the fact that this exercise will build your upper back and back extensors but it is at the expense of the underlying fragile spine. There are many other ways to work the back without ruining your spine.

BENT OVER DUMBBELL REVERSE FLYS (aching back & posterior deltoids)

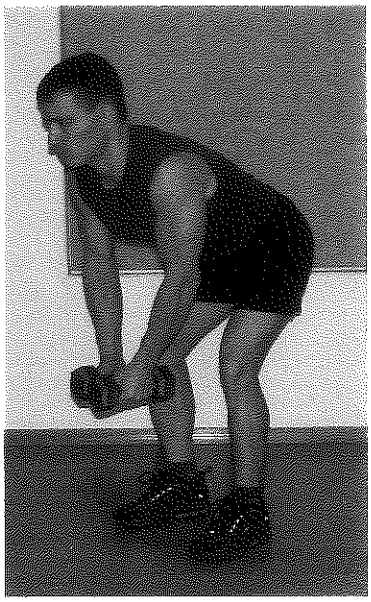


Figure 6.14 Bent over dumbbell reverse flys starting position

Starting Position (figure 6.14): Again the same old bent over position that is hard on the lower back.

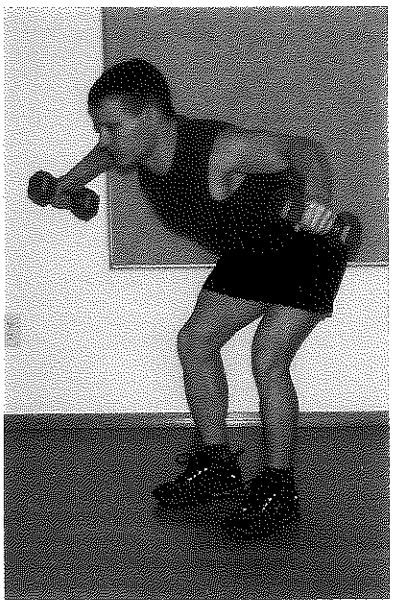


Figure 6.15 Bent over dumbbell reverse flys midpoint

Midpoint (figure 6.15): Yep, still bent over placing a lot of pressure on the discs. Quite honestly my lower back was sore after just demonstrating this pose for the photo. "Proper form" actually would have had me bending forward at about a 90 degree angle placing even more pressure on my low back. Since this exercise can be safely performed prone on an exercise ball or incline bench press I see no need to place undue stress on your low back.

STRAIGHT-LEGGED DEADLIFT with BARBELL OR DUMBBELS (aching back & hamstrings)

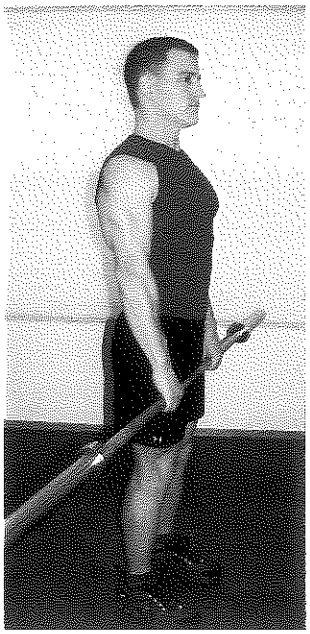


Figure 6.16 Straight-legged deadlift starting position

Starting Position (figure 6.16): This exercise starts out fine with the back in great position…

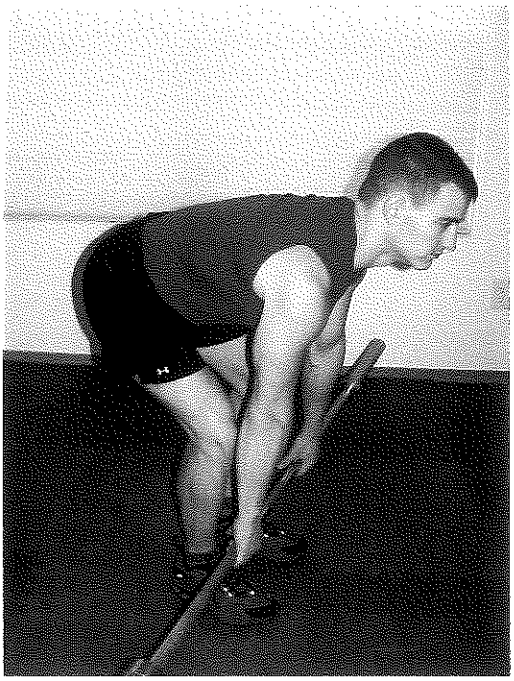


Figure 6.17 Straight-legged deadlift midpoint

Midpoint (figure 6.17): However, the exercise quickly loads the spine in the worst position possible. Here I have kept my back straight and bent my knees to ease some of the strain on my back but true fans of this exercise would call this cheating. I guess with this exercise the one who places the most destructive forces on the back is the winner!

Rationale: What do "good mornings", bent-over t-bar rowing, bent-over dumbbell/barbell rowing, bent-over reverse flys and straight-legged deadlifts all have in common? You guessed it; they all have you bent over at the waist. As you have already figured out this is not a good position from which to exercise because it places an extreme amount of pressure on the spine, especially the lumbar discs. Lumbar discs have a tendency to bulge, herniate, and even rupture on occasion so there is absolutely no need for us to help this process along. The further one bends over at the waist, even with the back straight (or with lordosis), the greater the pressure on the lumbar discs. This has been confirmed through many different studies[7-10] but below is a table summarizing the findings of one study.[7] However, to summarize it

basically shows that the further you forward flex your spine the more pressure you are placing on your discs.

With all research aside, I think that most of us would agree that the times that we have really injured out backs were when we where lifting something in a not so ideal position in which we were bent over at the waist. Why one would want to perform or even suggest the above exercises I cannot even fathom.

An interesting real life story involving some bad boy exercises!

I could hardly believe it. A patient came in the clinic recently and was excited as she was recovering well from a bad case of plantar fasciitis (foot arch pain) and was going to resume her lower extremity exercise program again. She had added some extra weight during her injury and was super motivated to lose it. She asked if she could run her exercises program by me. She started off with leg extensions, leg curls, leg press, hack squat, deadlift and then if that weren't bad enough she named "straight-legged dead lift." Ouch! I couldn't believe how many potentially damaging exercises that she was performing. My back hurt already. She explained how she wanted to work her hamstrings and how she thought straight-legged deadlifts were safe to perform as she had seen it in many books. I then described how disc pressure increases two to three fold (at least) when one bends over at the waist, even when the back is straight! She then thought that it would still be O.K. to perform the exercise because she had already had three out of five lumbar (low back) discs and vertebrae fused due to ruptured discs! No wonder her back was in a mess. She was only 25 years old! I tried to explain to her that if she wanted to exercise for a lifetime it would be a good idea to avoid exercises because they accelerate the "wear and tear" on her back. Although she seemed skeptical at first that these exercises were harmful she eventually saw the logic in what I was saying and learned how to successfully exercise without bulging another disc.

This is a great example of someone wanting to increase her level of fitness but unknowingly was sabotaging herself. Over the long haul these kinds of "training errors" will bring your fitness career to a grinding halt not to even mention the pain.

Aren't you glad that you are reading this book so that you can avoid this whole scenario?

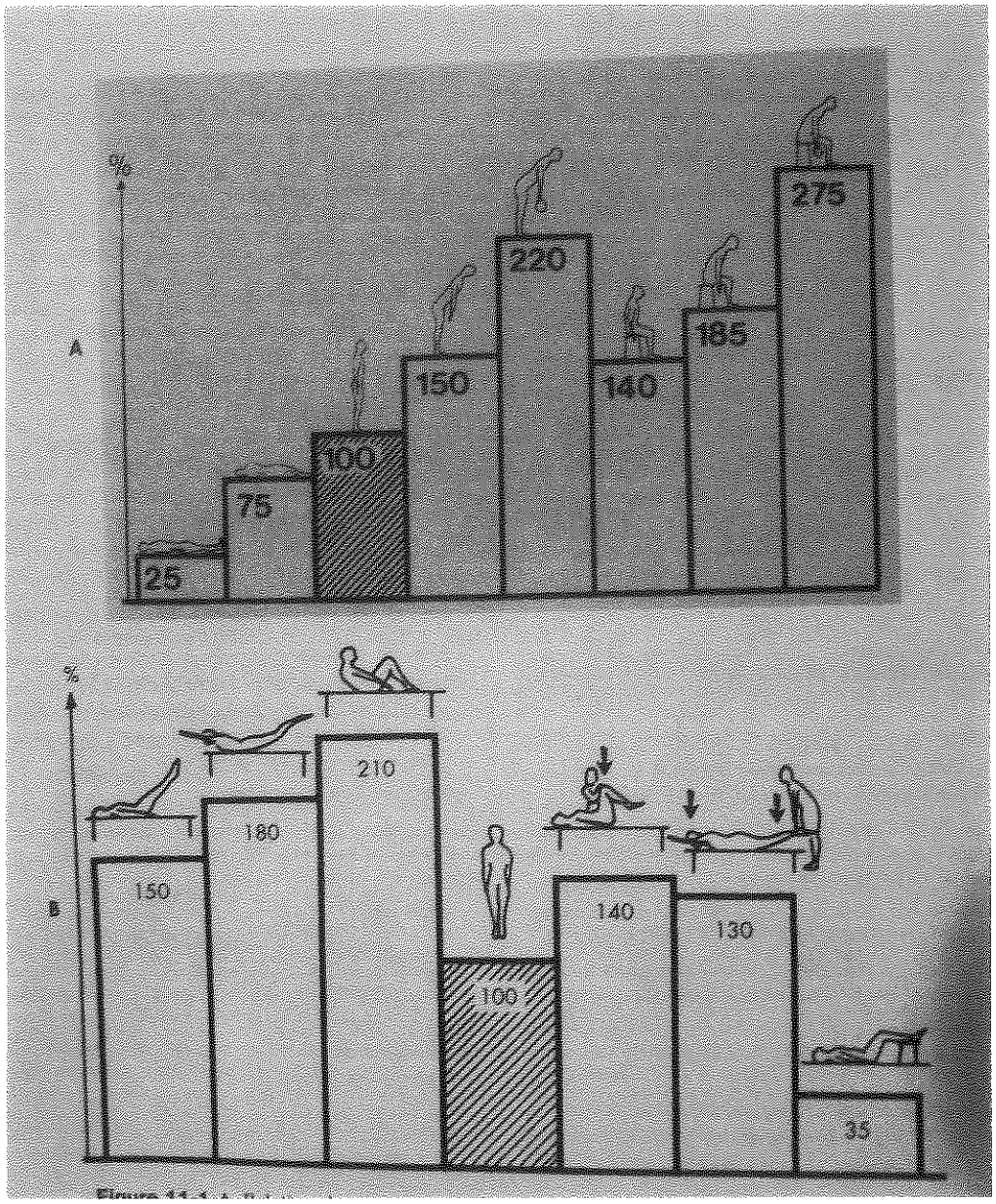


Figure 6.18 A, Relative change in pressure (or load) in the third lumbar disc in various positions in living subjects. B, Relative change in pressure (or load) in the third lumbar disc in various muscle-strengthening exercises in living subjects. (From Nachemson A: *The lumbar spine, an orthopaedic challenge*, Spine 1:59, 1976.)

BICEPS

None that are considered dangerous or red light.

TRICEPS

BENCH DIPS (triceps)

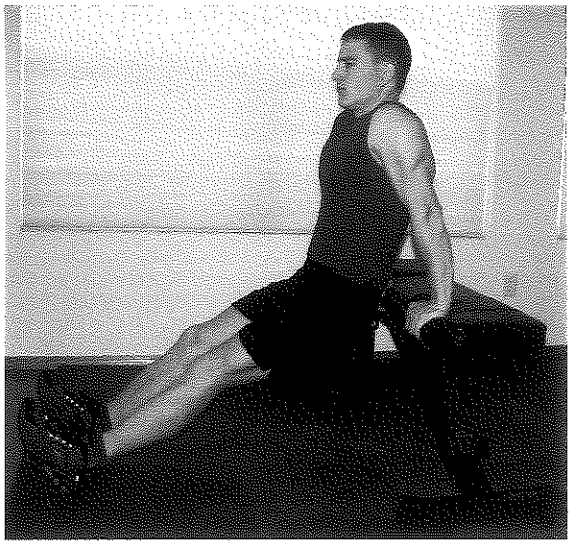


Figure 6.19 Bench dips starting position

Starting Position (6.19): Nothing too unusual going on in this position but that will soon change.

Midpoint (figure 6.20): Here is where things go bad as the front of the shoulders are overstretched by the shoulder being forced into too much extension. I really wanted to like this exercise as I like the idea of being able to do dips at home but these just are not worth it.

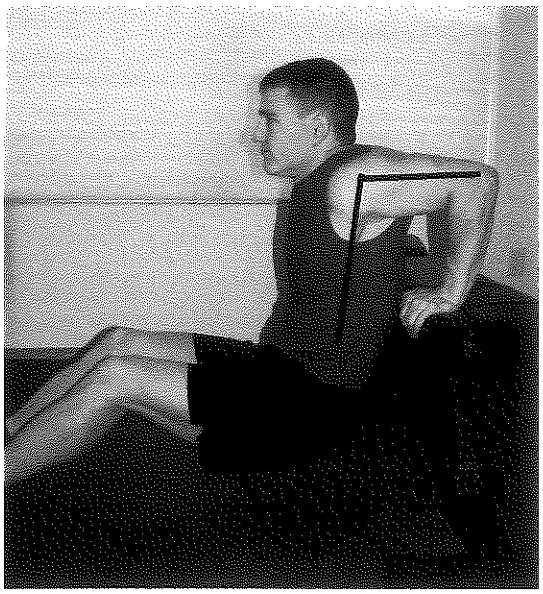


Figure 6.20 Bench dips midpoint showing excessive strain on the front of the shoulder from extreme extension.

Rationale: The front of the rotator cuff is a commonly injured area. This exercise places undue stress on this region because the shoulder is forced into an unusual amount of extension—at least 90 degrees. One can limit the depth but even 60 degrees of shoulder extension would be too much with this exercise. The biggest problem is that the body is in front of the shoulder to begin with so by the time you lower your body you are in an extreme position of extension while the shoulder is under load. I prefer a dip machine as it solves the problem of excessive shoulder extension because the body is in line with the shoulders at the beginning of the dip and as you lower into the dip your body can rotate backwards slightly with your shoulders to limit the amount of extension. Again, with so many good tricep exercises to choose from this just is not worth the risk. I doubt you would ever seriously injure your shoulders with this exercise but you would likely earn a good case of shoulder tendonitis or at least create too much flexibility (hypermobility) in the front of the shoulder if this is done over time. With the shoulders too much flexibility

can lead to a host of shoulder problems. You want your shoulders to be mobile but not too much so. A rotator cuff tear is even within the realm of possibility with this exercise.

THIGHS (QUADRICEPS)

LEG EXTENSION MACHINE (THIGHS/QUADS)

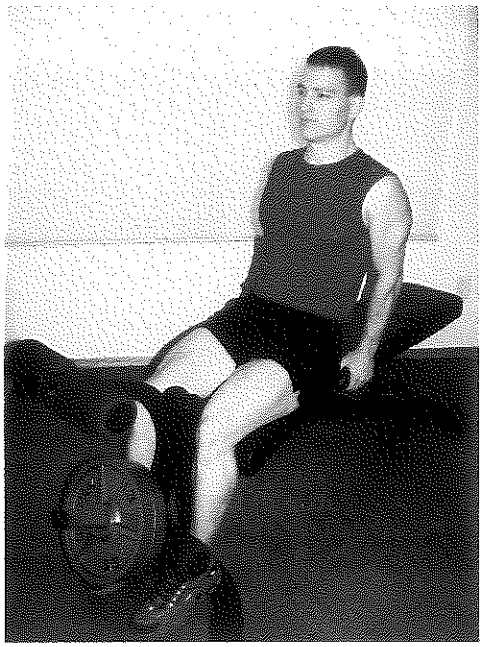


Figure 6.21 Leg extension machine starting position

Starting Position (figure 6.21): In this position the stage is set for the knees to have large compressive and shear forces placed on the patella and the massive quad muscles contract. The Quad contraction "grinds" the back side of the patella into the femur and over time will hasten the removal of the smooth cartilage which lines this joint. There is also an extreme shear force placed on the ligaments of the knee with this exercise. *Do not do this exercise if you have knee pain or a history of knee pain or especially if you have had an ACL (anterior cruciate reconstruction).*

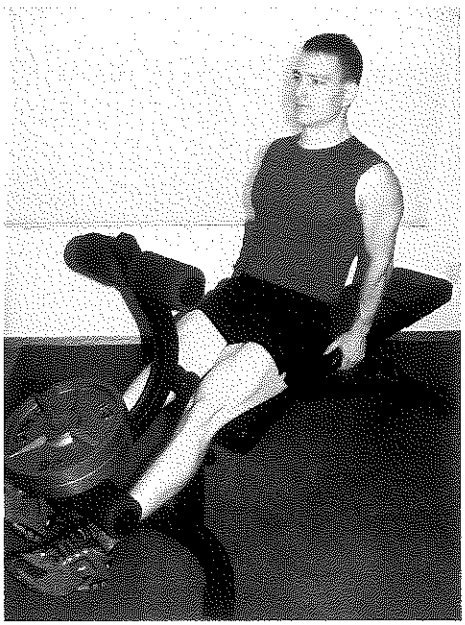


Figure 6.22 Leg extension machine midpoint

Midpoint (figure 6.22): The patella continues to be compressed and the shear force on the knee continues.

Rationale: I used to recommend that people perform these as long as they kept the weight light. However, after much experience in the clinic, research and my own personal experience with this exercise I now recommend that people perform other exercises to strengthen their quads.[11-12]

As mentioned earlier, the *first big problem with this exercise is that it places an extreme anterior (forward) shear force on the ligaments of the knee* (see figure 6.23 dotted white arrow below). This is because the knee is asked to do something that it

would not normally do if you were walking, say up some stairs. Namely, the quads contract without co-contraction of the hamstrings. The quads attach at the front of the leg (anterior tibia) and the hamstrings attach on the sides of the leg just below the knee (medial tibia and lateral fibula) so in normal operation of the knee both the quads and hamstrings contract at once thus mainly neutralizing each other eliminating the shear force. However, in this exercise the quads contract very powerfully (see figure 6.23 solid black arrow) but the hamstring contraction is mild so an extreme shear force is created about the knee which yanks on the internal structures of the knee including ligaments, cartilage (meniscus) and tendons.

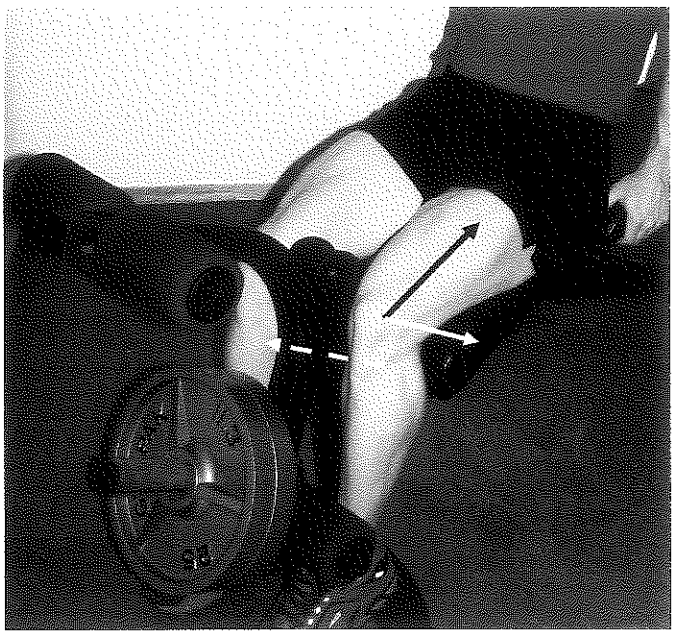


Figure 6.23 Leg extension machine: Arrows represent general direction of force applied to knee. Quad force—solid black arrow. Patellar compressive forces—solid white arrow, Anterior shear force on knee—dotted white arrow.

The second problem with this exercise is that it creates a huge amount of patellar compression (see figure 6.23 solid white arrow). As the powerful quads contract at the 90 degree angle, initially at such an abrupt angle, much of the quad's force is translated into patellar compression. The patellar compression lessens as the knee moves towards being straight (extension) but is still higher than with many other exercises.

In summary, *since knee extensions have great potential for accelerating knee wear and tear as well as causing pain through excessive shear and compressive forces, this exercise is best left undone.* Choose the other exercises in the green light section where the knee is asked to work in a more "normal" fashion with the foot planted on the ground or a leg press (closed chain exercise) thus causing co-contraction of the quads and hamstrings minimizing the shear force about the knee. The patellar compression issue is addressed by controlling the depth of the knee bend.

OLYMPIC / ATHLETIC LIFTS—sports conditioning for speed and power

In this section of red light exercises we will now cover the Olympic lifts: squat, deadlift, power-clean and snatch. Since these exercises are all in this section for generally common reasons, the rationale for this will be presented after the exercises have been shown in brief.

DEEP AND HEAVY SQUATS (> 90 DEGREES OF KNEE BEND WITH WEIGHT > BODY WEIGHT)

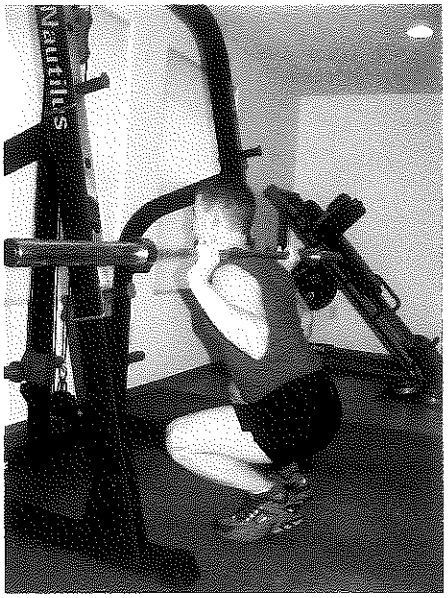


Figure 6.24 Deep squats with knees flexion greater than 90 degrees—this places a lot of damaging compression on the knee.

What we are talking about here, unlike the yellow light chapter, is squats lower than 90 degrees (figure 6.24). This is the more standard way to perform squats where the thighs are taken to a parallel position to the floor. *This extreme position of knee flexion places a huge amount of compression on your patella and low back and is not recommended.*

Please see yellow light chapter for correct squat form. Keep in mind that my recommendations are different than the "traditional" method.

DEADLIFT (OLYMPIC LIFT—POWER)

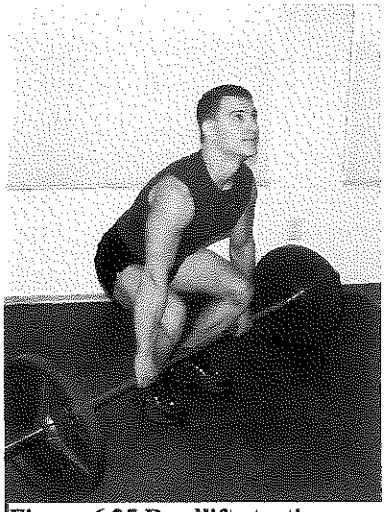
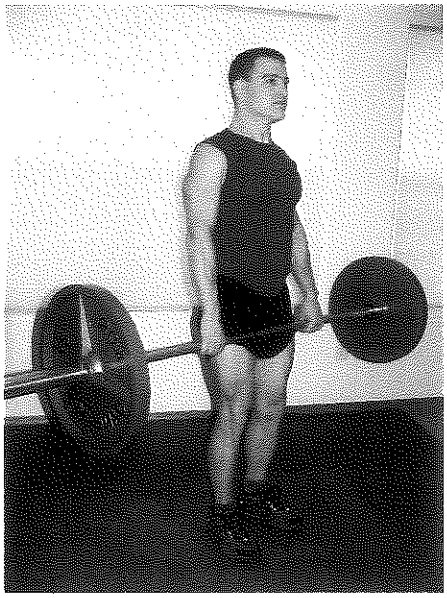


Figure 6.25 Deadlift starting position

Starting Position (figure 6.25): Not a bad position as proper body mechanics are being used. However, the main issue here is the shear weight that will be literally exploded upwards in a moment. This weight causes extreme compression on the lumbar discs. Notice the strange look on my face! I know that I am about to do something bad for my back.

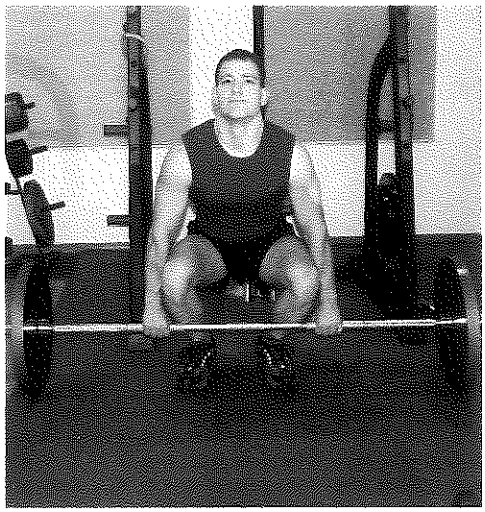


Midpoint (figure 6.26): At least you are standing now but again your lumbar discs are bulging like a set of radial tires loaded with an extra 1200 pounds.

I do not recommend this exercise for anyone who values the longevity of their spine.

Figure 6.26 Deadlift midpoint

POWER CLEAN (OLYMPIC LIFT—POWER)



Starting Position (figure 6.27)

Figure 6.27 Power clean starting position

Midpoint (figure 6.28): Not a recommended exercise for same reasons as deadlift—spine compression and increased disc pressure.

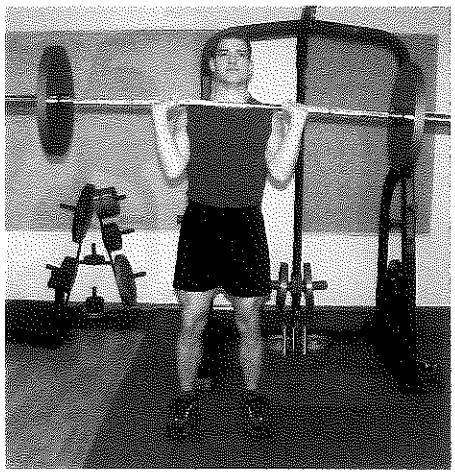


Figure 6.28 Power clean midpoint

SNATCH (OLYMPIC LIFT—POWER)
With the exception of a wider hand grip, the snatch uses a similar starting position as the power clean. The finish position is different than power clean as the weight is snapped overhead with elbow locked.

Again this exercise is not recommended for the average lifter due to increased spinal compression and wear and tear on the back.

Rational (squats, deadlift, powerclean & snatch): Squatting above your body weight, deadlift, powerclean and snatch are all placed in the same category as they all place excessive compressive forces on the vertebral discs. While these lifts are commonly employed for high-school, college, and professional athletes because they help develop power, they do not have a purpose for the weight lifter who wants to lift for long term general health purposes. The main problem is that although the lower extremity can generally handle the large amount of weight used, the spine must be used to transmit the weight to the lower extremities. Unfortunately, the spine is the "weak link" so to speak in all of us. We were designed with range of motion and function in mind for the most part—not necessarily brute strength.

In my opinion these exercises carry with them a high potential for injury. My experience in the clinic, as well as with my own lifting, confirms these suspicions. It would be nice if there were disc pressure studies to support my claims with these specific lifts but to date none have been performed. However, from the previous sited intradiscal pressure studies we can safely surmise that disc pressure markedly increases with these lifts.

For people who want to lift through life without injury these exercises are not worth performing as the risk to benefit ratio is not worth it. Yes, you will gain muscle with these exercises but if you get injured while doing so your lifting career may be over or at least put on hold. Although many athletes perform these exercises routinely they are usually younger. As these athletes age they often face severe joint pain for their exercise indiscretions.

I had a recent conversation with a champion power lifter who is now 50. He had not competed for about 15 years due to a serious wrist injury. I told him of my concerns regarding the power lifts and asked what his experience was since he had participated professionally. I expected him to become defensive since he was obviously in favor of the power lifts, at least in the past. He explained that he now lives with spinal pain and "arthritis" every day of his life although he still stays active. Recent x-rays confirmed that he has moderate to severe degenerative disc disease at multiple levels of his thoracic and lumbar spine. He further explained that he still lifts weights but was forced to give up the power lifts competitively due to his wrist injury and was forced to quit at a recreational level from his spinal pain.

Although I realize this is only one case I could tell you many more stories from patients in their 20s and 30s who were very powerful and fit athletes. Many of these athletes were

in rehab for post-surgical disc surgery (lumbar laminectomy) and were injured while performing these lifts. So injury during these lifts is not an isolated event.

In summary, I do not recommend these power lifts for the average lifter as they will accelerate the wear and tear on your spine. It is a much better approach to pick from the many safe lifts and build muscle and health without the set backs and frustration of injury. You get one body so please take care of it and I hope this book helps.

HAMSTRINGS
See previous section with Straight-legged deadlift

CALVES
No red light exercise for calves—see yellow light chapter.

CHAPTER 7--Summary/Conclusion:

This project has given some compelling reasons to lift weights which include the following:

- Increase lean muscle mass and speed up metabolism
- Prevent muscle loss or age-related muscle wasting (sarcopenia)
- Decrease arthritic pain
- Improve bone density
- Improve balance
- Improve glucose metabolism and decrease risk of adult onset diabetes
- Feel and look better and have more energy
- Reduce body fat and help fight colon and breast cancer
- Sleep better and relieve depression
- Decrease low back pain
- Maintain independence now and in your latter years

Many guidelines have also been presented, given the current research, as to how often one should lift weights, how many sets and how many repetitions one should perform. Specifically, one should try to workout with the weights two times per week and up to three if one's schedule allows. To follow is a summary of sets and repetitions for beginning, intermediate, and advanced lifters.

- Beginners (new to weight training or haven't lifted for many years):
  - Perform 1 set per muscle group working in the 15-20 repetition range. This workout will go fast and require only a minimal investment in time. 10-15 minutes two times per week.
  - After 1-2 months work up to 1-2 sets per muscle group in the 10-15 repetition range.
  - Remember you only need to add weight in 2 ½ to 5 lb increments to decrease how many repetitions you are performing. Also be sure that your form is perfect before adding weight.
- Intermediate (have been lifting weights for 1-3 months without any pain or unusual muscle/joint soreness):
  - Perform 2 sets per muscle group working in the 10-15 repetition range.
- Advanced (have been lifting weights for 6 months to 1 year without difficulty and are ready for a greater challenge):
  - Perform 3 sets per muscle group in the 8-15 repetition range.

Exercises were broken down into green, yellow and red light categories depending on their propensity to cause injury. Specifically, risk of injury while performing a green light exercise is minimal when proper form and appropriate weight is used. Green light exercises are good to select for beginners. Yellow light exercises have a greater risk of injury and are not good choices for beginning lifters. Instead, they should be reserved for intermediate and advanced lifters once a base of strength and muscle control is established. Yellow light exercises have a higher risk of injury because more stress is placed on the joint and tendons due to the presence of longer lever arms, joint shear force and spinal compressive forces. Lastly, red light exercises were presented that should not be performed, regardless of lifting expertise, due to their ability

to cause injury even when proper form is observed. Most red light exercises earn their designation as such due to an injury prone position that is attained during the exercise or due to excessive spinal compressive forces.

This project is meant to blend modern medical research with current practice of weight training. Most weight training books written today still recommend performing injury prone exercises. This text is meant to help delineate the useful and safe exercises from the potentially harmful. It is hoped that this project will help improve peoples' lives by lessening their risk of injury while lifting weights.

Future research is still needed as currently no research exists as to how the Olympic power lifts affect the longevity of the spine. Although this research gap exits, clinical practice, physics, and current intradiscal pressure studies would suggest that these power lifts would accelerate spinal degenerative changes. It should also be noted that very few power lifters are able to compete beyond middle age secondary to career ending injuries (usually spine) sustained while training or competing for a power lifting competition. This might be a difficult area of research, as it would require a long term study; the results, however, would fill in a current gap in the literature.

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